SCREENING-LEVEL HAZARD CHARACTERIZATION
Kerosene/Jet Fuel Category

SPONSORED CHEMICALS

Kerosene (petroleum)	**CASRN 8008-20-6**
Hydrodesulfurized kerosene (petroleum)	**CASRN 64742-81-0**
Acid treated light distillate, light	**CASRN 64742-14-9**
Chemically neutralized light distillates (petroleum)	**CASRN 64742-31-0**
Hydrotreated light distillates (petroleum)	**CASRN 64742-47-8**
Heavy aliphatic solvent naphtha (petroleum)	**CASRN 64742-96-7**

SUPPORTING CHEMICALS

Sweetened kerosene (petroleum)	**CASRN 91770-15-9**
Heavy aromatic solvent naphtha (petroleum)	**CASRN 101316-80-7**
Diesel fuel (Nigerian)	**CASRN 68334-30-5**
JP 4 (heavy kerosene; Fuel No. 1)	**CASRN 50815-00-4**
JP 8 (kerosene; Fuel Oil No. 1)	**CASRN 82863-50-1**
Jet Propellant 5 (JP-5)	**No CASRN**
Jet Fuel B	**No CASRN**
Jet Fuel A/A-1 (aviation turbine fuel, kerosene type)	**No CASRN**
Naphtha (petroleum), hydrotreated heavy	**CASRN 64742-48-9**
Naphtha (petroleum), hydrotreated light	**CASRN 64742-49-0**
Alkanes, C_{7-10}, iso-	**CASRN 90622-56-3**
1-Tetradecene	**CASRN 1120-36-1**
1-Hexadecene	**CASRN 629-73-2**

The High Production Volume (HPV) Challenge Program[1] was conceived as a voluntary initiative aimed at developing and making publicly available screening-level health and environmental effects information on chemicals manufactured in or imported into the United States in quantities greater than one million pounds per year. In the Challenge Program, producers and importers of HPV chemicals voluntarily sponsored chemicals; sponsorship entailed the identification and initial assessment of the adequacy of existing toxicity data/information, conducting new testing if adequate data did not exist, and making both new and existing data and information available to the public. Each complete data submission contains data on 18 internationally agreed to "SIDS" (Screening Information Data Set[1,2]) endpoints that are screening-level indicators of potential hazards (toxicity) for humans or the environment.

The Environmental Protection Agency's Office of Pollution Prevention and Toxics (OPPT) is evaluating the data submitted in the HPV Challenge Program on approximately 1400 sponsored

[1] U.S. EPA. High Production Volume (HPV) Challenge Program; http://www.epa.gov/chemrtk/index.htm.
[2] U.S. EPA. HPV Challenge Program – Information Sources; http://www.epa.gov/chemrtk/pubs/general/guidocs.htm.

chemicals by developing hazard characterizations (HCs). These HCs consist of an evaluation of the quality and completeness of the data set provided in the Challenge Program submissions. They are not intended to be definitive statements regarding the possibility of unreasonable risk of injury to health or the environment.

The evaluation is performed according to established EPA guidance[2,3] and is based primarily on hazard data provided by sponsors; however, in preparing the hazard characterization, EPA considered its own comments and public comments on the original submission as well as the sponsor's responses to comments and revisions made to the submission. In order to determine whether any new hazard information was developed since the time of the HPV submission, a search of the following databases was made from one year prior to the date of the HPV Challenge submission to the present: (ChemID to locate available data sources including Medline/PubMed, Toxline, HSDB, IRIS, NTP, ATSDR, IARC, EXTOXNET, EPA SRS, etc.), STN/CAS online databases (Registry file for locators, ChemAbs for toxicology data, RTECS, Merck, etc.) and Science Direct. OPPT's focus on these specific sources is based on their being of high quality, highly relevant to hazard characterization, and publicly available.

OPPT does not develop HCs for those HPV chemicals which have already been assessed internationally through the HPV program of the Organization for Economic Cooperation and Development (OECD) and for which Screening Initial Data Set (SIDS) Initial Assessment Reports (SIAR) and SIDS Initial Assessment Profiles (SIAP) are available. These documents are presented in an international forum that involves review and endorsement by governmental authorities around the world. OPPT is an active participant in these meetings and accepts these documents as reliable screening-level hazard assessments.

These hazard characterizations are technical documents intended to inform subsequent decisions and actions by OPPT. Accordingly, the documents are not written with the goal of informing the general public. However, they do provide a vehicle for public access to a concise assessment of the raw technical data on HPV chemicals and provide information previously not readily available to the public.

[3] U.S. EPA. Risk Assessment Guidelines; http://cfpub.epa.gov/ncea/raf/rafguid.cfm.

Chemical Abstract Service Registry Number (CASRN)	**Sponsored Chemicals** **CASRN 8008-20-6** **CASRN 64742-81-0** **CASRN 64742-14-9** **CASRN 64742-31-0** **CASRN 64742-47-8** **CASRN 64742-96-7** **Supporting Chemicals** **CASRN 91770-15-9** **CASRN 101316-80-7** **CASRN 68334-30-5** **CASRN 50815-00-4** **CASRN 82863-50-1** **CASRN 64742-48-9** **CASRN 64742-49-0** **CASRN 90622-56-3** **CASRN 1120-36-1** **CASRN 629-73-2**
Chemical Abstract Index Name	**Sponsored Chemicals** **Kerosine (petroleum)** **Distillates (petroleum), acid-treated light** **Distillates (petroleum), chemically neutralized light** **Kerosine (petroleum), hydrodesulfurized** **Distillates (petroleum), hydrotreated light** **Solvent naphtha (petroleum), heavy aliph.** **Supporting Chemicals** **Kerosine (petroleum), sweetened** **Solvent naphtha (petroleum), hydrocracked heavy arom.** **Fuels, diesel** **JP 4 (heavy kerosene; Fuel No. 1)** **JP 8 (kerosene; Fuel Oil No. 1)** **Jet Propellant 5 (JP-5)** **Jet Fuel A/A-1 (aviation turbine fuel, kerosene type)** **Naphtha, petroleum, hydrotreated heavy** **Naphtha, petroleum, hydrotreated light** **Alkanes, $C_{7-10,}$ iso-** **1-Tetradecene** **1-Hexadecene**
Structural Formula	**Sponsored/Supporting Chemicals** **See APPENDIX**

Summary

The kerosene/jet fuels category consists of liquids whose components possess moderate to high vapor pressure and low to moderate water solubility. The components of the kerosene/jet fuels category will have moderate to low mobility in soil. Volatilization is expected to be moderate to high for most constituents of the kerosene/jet fuels category. The rate of hydrolysis is negligible since paraffins, naphthenes, and the aromatic hydrocarbons contained in this category do not possess water-sensitive functional groups that hydrolyze under environmental conditions. The rate of atmospheric photooxidation is expected to be slow to rapid for most components of the category. The components of the kerosene/jet fuels category are expected to possess low (P1) to moderate (P2) persistence and low (B1) to high (B3) bioaccumulation potential.

Acute oral and dermal toxicity are low and acute inhalation toxicity is moderate for CASRNs 8008-20-6 and 64742-81-0. Repeated oral exposure of rats to the supporting chemical JP-8 Jet Fuel (No CASRN) by gavage resulted in a dose-dependent decrease in body weight, increased relative liver weight, increased total bilirubin, and hematological changes at 750 mg/kg-bw/day, the lowest dose tested; the NOAEL was not established. Repeated dermal exposure of rabbits to CASRN 8008-20-6 for 4 weeks showed decreased red blood cell count in males and increased absolute and relative spleen weight in females at 200 mg/kg-bw/day, the lowest dose tested; the NOAEL for systemic toxicity was not established. Repeated dermal exposure of rats to CASRN 64742-81-0 for 13 weeks resulted in skin irritation, histological effects on skin and increased absolute and relative spleen weight in females at 495 mg/kg-bw/day; the NOAEL is 330 mg/kg-bw/day. Repeated inhalation exposure of rats to CASRN 64742-81-0 for 4 weeks showed no adverse effects at 0.024 mg/L; the NOAEC is 0.024 mg/L/day (highest concentration tested). In a reproductive/developmental toxicity screening study, dermal exposure of rats to CASRN 64742-81-0 showed reduced body weight gain and relative kidney weight in males at 494 mg/kg/day, but produced no effects on testes, epididymides or ovaries; the NOAEL for reproductive toxicity is 494 mg/kg/day (highest dose tested). In the same study, no effects were observed on maternal or developmental toxicity; the NOAEL for maternal/developmental toxicity is 494 mg/kg/day (highest dose tested). In a prenatal inhalation developmental toxicity study, exposure to CASRN 8008-20-6 vapors caused no effects on dams or fetuses; the NOAEC for maternal and developmental toxicity is 364 ppm/day (highest concentration tested). CASRN 64742-81-0 and the supporting chemical jet fuel A (No CASRN) induced chromosomal aberrations in rats and mice. Repeated dermal exposures of male mice to CASRN 8008-20-6 for 2 years led to increased incidence of dermal irritation and tumors only in the presence of chronic skin irritation. The supporting chemical, JP-5 jet fuel (No CASRN), did not demonstrate evidence of carcinogenicity in mice following dermal exposure for 2 years. CASRN 8008-20-6 is irritating to rabbit skin and eyes and is not a dermal sensitizer in guinea pigs.

No adequate data are available for the sponsored substances. Based on the supporting chemicals, CASRNs 90622-56-3, 64742-48-9, 1120-36-1 and 629-73-2, the 96-h LC_{50} for fish is 0.11 mg/L, the 48-h EC_{50} for aquatic invertebrates is 0.9 mg/L and the 72-h EC_{50} for aquatic plants is 0.4 mg/L for biomass and >0.4 mg/L for growth rate. Based on the supporting chemicals, CASRN 64742-49-0 and 1120-36-1, the 21-d chronic NOEC/LOEC for aquatic invertebrates is 0.17 mg/L and 0.32 mg/L, respectively.

No data gaps were identified under the HPV Challenge Program.

The sponsor, American Petroleum Institute, submitted a Test Plan and Robust Summaries to EPA for kerosene/jet fuel on December 30, 2003. EPA posted the submission on the ChemRTK HPV Challenge website on March 3, 2004 (http://www.epa.gov/chemrtk/pubs/summaries/kerjetfc/c15020tc.htm). EPA comments on the original submission were posted to the website on August 31, 2005. Public comments were also received and posted to the website. The sponsor submitted updated/revised documents on December 16, 2005 and September 21, 2010, which were posted to the ChemRTK website on January 12, 2006 and January 6, 2011.

Category Justification

The kerosene/jet fuel category consists of complex petroleum refinery streams derived from crude oil that have similar composition and carbon ranges (C9 to C16). Similarities in the composition of the streams are expected to result in similar physicochemical, environmental fate and toxicological properties. This hazard characterization only addresses those category members submitted in the final category assessment document (http://www.epa.gov/chemrtk/pubs/summaries/kerjetfc/c15020ad2.pdf).

CASRN 64742-47-8 [hydrotreated light distillates (petroleum)] is included because the carbon range (C9 to C16) is similar to the other members in the category. Several streams from the original submission were removed from the category and are not included in this hazard characterization. CASRN 68477-58-7 [distillates (petroleum), steam-cracked petroleum distillates] is not included because the carbon range differs from the other fractions in the category and this could impact the chemical properties and toxicity. Eight petroleum-based solvent streams from the original test plan are not included due to the limited information provided. CASRN 68333-23-3 [thermocracked naphtha heavy coker, C6 – C15] will be addressed in a separate hazard characterization which will be available in the future at: http://iaspub.epa.gov/oppthpv/hpv_hc_characterization.get_report_by_cas?doctype=2.

Justification for Supporting Chemicals

Several supporting chemicals are used to address the human health and ecotoxicity hazard of the kerosene/jet fuel category. They are listed in Table 1.

Jet fuels are appropriate supporting chemicals for the category because they are primarily composed of the two category members: straight run kerosene (CASRN 8008-20-6) and hydrodesulfurized kerosene (CASRN 64742-81-0). Data for the jet fuels can be used to address the physicochemical, environmental fate and health effects endpoints for the category.

For aquatic toxicity, data submitted for the category member, hydrodesulfurized kerosene (petroleum) (CASRN 64742-81-0), were considered inadequate because the results were reported based on nominal loading rates, not measured concentrations. Similarly, data submitted for CASRN 91770-15-9 and 101316-80-7 are not adequate.

Table 1. Supporting Chemicals for the Kerosene/Jet Fuel Category				
CASRN	**Name**	**PChem & Fate**	**Human Health**	**Ecotoxicity**
91770-15-9	**Sweetened kerosene (petroleum)**	**X**		
101316-80-7	**Heavy aromatic solvent naphtha (petroleum)**	**X**		
68334-30-5	**Diesel fuel (Nigerian)**	**X**		
50815-00-4	**JP 4 (heavy kerosene; Fuel No. 1)**	**X**		
82863-50-1	**JP 8 (kerosene; Fuel Oil No. 1)**	**X**	**X**	
No CASRN	**Jet Propellant 5 (JP-5)**	**X**	**X**	
No CASRN	**Jet Fuel B**	**X**		
No CASRN	**Jet Fuel A/A-1 (aviation turbine fuel, kerosene type)**	**X**	**X**	
64742-48-9	**Naphtha (petroleum), hydrotreated heavy**			**X**
64742-49-0	**Naphtha (petroleum), hydrotreated light**			**X**
90622-56-3	**Alkanes, $C_{7-10,}$ iso-**			**X**
1120-36-1	**1-Tetradecene**			**X**
629-73-2	**1-Hexadecene**			**X**

EPA determined that the measured data from the C7-C9 aliphatic hydrocarbon solvents [(naphtha (petroleum), hydrotreated heavy (CASRN 64742-48-9), naptha (petroleum), hydrotreated light (CASRN 64742-49-0) and alkanes, C7-C10, iso (CASRN 90622-56-3)], 1-tetradecene (CASRN 1120-36-1) and 1-hexadecene (CASRN 629-73-2) are appropriate to support the ecotoxicity endpoints for this category based on their similar physico-chemical properties, environmental fate and mode of toxic action (narcosis). In addition, these chemicals are used to set boundaries and cover the low and high carbon numbers in the category (C9-C16). Therefore, data from these supporting chemicals can adequately characterize the aquatic toxicity hazard for this category.

The C7-C9 aliphatic hydrocarbons (CASRNs 64742-48-9, 64742-49-0 and 90622-56-3) have been assessed in the OECD HPV program (SIAM 30; http://webnet.oecd.org/hpv/UI/SIDS_Details.aspx?Key=d3906311-a0e0-4fe8-a66b-7159b864a557&idx=0).

1-Tetradecene (CASRN 1120-36-1: SIAM 11) has been assessed in the OECD HPV program as a member of the alpha olefins category (http://www.chem.unep.ch/irptc/sids/OECDSIDS/AOalfaolefins.pdf).

1-Hexadecene (CASRN 629-73-2: SIAM 19) has been assessed in the OECD HPV program as a member of the higher olefins category (http://www.chem.unep.ch/irptc/sids/OECDSIDS/HigherOlefins.pdf).

1. Chemical Identity

1.1 Identification and Purity

From the API Test Plan submission (i.e. Category Assessment Document), "kerosene" is a generic term referring to a fraction of crude oil that boils approximately in the range 145 to 300 degrees C and consists of hydrocarbons approximately in the C9-C16 range. The composition of kerosene varies depending on the source of crude oil and refinery processes used and is a complex mixture of branched and straight chain paraffins and naphthenes (at least 70% by volume), aromatic hydrocarbons such as alkyl benzenes and alkylnaphthalenes (up to 25%) and olefins (less than 5% by volume). Kerosenes can contain minor amounts of additives generally less than 0.1% by volume.

1.2 Physical-Chemical Properties

A summary of physical-chemical properties and environmental fate data submitted is provided in Table 2.

Kerosene and jet fuels are obtained either from the distillation of crude oil under atmospheric pressure (straight-run kerosene) or from catalytic, thermal, or steam cracking of heavier petroleum streams (cracked kerosene). These substances are liquids whose components possess moderate to high vapor pressure and low to moderate water solubility.

2. General Information on Exposure

2.1 Production Volume and Use Pattern

The C Kerosene / Jet Fuel category chemicals had an aggregated production and/or import volume in the United States greater than 2 billion 100 million pounds in calendar year 2005.

- CASRN 8008-20-6: 1 billion pounds and greater;
- CASRN 64742-14-9: 1 billion pounds and greater;
- CASRN 64742-96-7: 100 million to < 500 million pounds;

CASRN 64742-31-0 was not reported in the 2006 IUR.

CASRN 64742-14-9 and 64742-96-7:
No industrial processing and uses, and commercial or consumer uses were reported for these chemicals.

CASRN 8008-20-6:
Non-confidential information in the IUR indicated that the industrial processing and uses for the chemical include petroleum refineries and petroleum bulk stations and terminals as fuels. Non-confidential commercial and consumer uses of this chemical include transpiration products and "other."

2.2 Environmental Exposure and Fate

The components of the kerosene/jet fuels category are expected to possess moderate to low mobility in soil. Kerosine (petroleum) (CASRN 8008-20-6) achieved 58.6% of its theoretical biochemical oxygen demand (BOD) in 28 days using a manometric respirometry test (OECD 301F). It was classified by ?? as not readily biodegradable but inherently biodegradable since significant degradation did occur. Two distillate fuels, a low sulfur diesel fuel and a Nigerian diesel fuel (CASRN 68334-30-5), achieved 60 and 57.5% of their theoretical BOD, respectively, within 28 days using a manometric respirometry (OECD 301F) test; these diesel fuels were also characterized by ?? as inherently biodegradable. An aviation turbine fuel (CASRN not stated) was degraded up to 46% within 10 days in fresh water using a study method which appears to be similar to the closed bottle test (OECD 301D). Many of the components of these mixtures are expected to degrade quickly in the environment; however, branched paraffins or napthenes may be somewhat more persistent. Volatilization is expected to be moderate to high for most constituents of the kerosene/jet fuels category. The rate of hydrolysis is negligible since paraffins, naphthenes, and the aromatic hydrocarbons contained in this category do not possess water-sensitive functional groups that hydrolyze under environmental conditions. The components of the kerosene/jet fuels category are expected to possess low (P1) to moderate (P2) persistence and low (B1) to high (B3) bioaccumulation potential.

Conclusion: The kerosene/jet fuels category consists of liquids whose components posses moderate to high vapor pressure and low to moderate water solubility. The components of the kerosene/jet fuels category will have moderate to low mobility in soil. Volatilization is expected to be moderate to high for most constituents of the kerosene/jet fuels category. The rate of hydrolysis is negligible since paraffins, naphthenes, and the aromatic hydrocarbons contained in this category do not possess water-sensitive functional groups that hydrolyze under environmental conditions. The rate of atmospheric photooxidation is expected to be slow to rapid for most components of the category. The components of the kerosene/jet fuels category are expected to possess low (P1) to moderate (P2) persistence and low (B1) to high (B3) bioaccumulation potential.

Table 2. Physical-Chemical Properties of the Kerosene/Jet Fuels Category[1]

Property	SPONSORED CHEMICAL Kerosene (petroleum)	SPONSORED CHEMICAL Distillates (petroleum), acid-treated light	SPONSORED CHEMICAL Distillates (petroleum), chemically neutralized light	SPONSORED CHEMICAL Kerosene (petroleum), hydrodesulfurized	SPONSORED CHEMICAL Distillates (petroleum), hydrotreated light	SPONSORED CHEMICAL Solvent naphtha (petroleum), heavy aliph.
CASRN	8008-20-6	64742-14-9	64742-31-0	64742-81-0	64742-47-8	64742-96-7
Molecular Weight	Complex mixture with a carbon range of approximately C9 – C16					
Physical State	Liquid					
Melting Point	-55°C (measured pour point)[2]	No data. Typical pour point values for kerosene or jet fuels are <0°C.				
Boiling Point	125–292°C (measured)	149–257.1°C (measured/ estimated)[2,3,4]	149–257.1°C (measured/ estimated)[2,3,4]	175–284°C measured); 156–255°C (measured)	149–257.1°C (measured/ estimated)[2,3,4]	188.8–257.1°C (measured/ estimated)[2,3,4]
Vapor Pressure	10.5 mm Hg at 37.8°C (measured)	0.03–5.4 mm Hg at 25°C (measured/ estimated)[2,3,4]	0.03–5.4 mm Hg at 25°C (measured/ estimated)[2,3,4]	0.03–5.4 mm Hg at 25°C (measured/ estimated)[2,3,4]	0.03–5.4 mm Hg at 25°C (measured/ estimated)[2,3,4]	0.03–0.9 mm Hg at 25°C (measured/ estimated)[2,3,4]
Dissociation Constant (pK_a)	Not applicable					
Henry's Law Constant	0.01–29 atm-m^3/mol (estimated)[2,3]	0.01–29 atm-m^3/mol (estimated)[2,3]	0.01–29 atm-m^3/mol (estimated)[2,3]	0.01–29 atm-m^3/mol (estimated)[2,3]	0.01–29 atm-m^3/mol (estimated)[2,3]	0.02–29 atm-m^3/mol (estimated)[2,3]
Water Solubility	10.4 mg/L at 20°C (measured)	0.001–52.2 mg/L at 25°C (measured/ estimated)[2,3,4]	0.001–52.2 mg/L at 25°C (measured/ estimated)[2,3,4]	0.001–52.2 mg/L at 25°C (measured/ estimated)[2,3,4]	0.001–52.2 mg/L at 25°C (measured/ estimated)[2,3,4]	0.001–9.8 mg/L at 25°C (measured/ estimated)[2,3,4]
Log K_{ow}	3.7–8.0 (measured/ estimated)[2,3,4]	3.7–8.0 (measured/ estimated)[2,3,4]	3.7–8.0 (measured/ estimated)[2,3,4]	3.7–8.0 (measured/ estimated)[2,3,4]	3.7–8.0 (measured/ estimated)[2,3,4]	4.6–8.0 (estimated)[2,3]

[1] American Petroleum Institute Petroleum HPV Testing Group. 2010. Revised Robust Summary and Test Plan for Kerosene/Jet Fuels. Available online at http://www.epa.gov/chemrtk/pubs/summaries/kerjetfc/c15020tc.htm as of January 14, 2011.
[2] Data range presented for representative structures provided in the Appendix.
[3] U.S. EPA. 2010. Estimation Programs Interface Suite™ for Microsoft® Windows, v4.00. U.S. Environmental Protection Agency, Washington, DC, USA. Available online at http://www.epa.gov/opptintr/exposure/pubs/episuitedl.htm as of January 14, 2011.
[4] SRC. The Physical Properties Database (PHYSPROP). Syracuse, NY: Syracuse Research Corporation. Available online at http://www.syrres.com/esc/physprop.htm as of January 14, 2011.

Table 2. Physical-Chemical Properties of the Kerosene/Jet Fuels Category[1]

Property	SUPPORTING CHEMICAL Kerosene (petroleum), sweetened	SUPPORTING CHEMICAL Solvent naphtha (petroleum), hydrocracked heavy arom.	SUPPORTING CHEMICAL Fuels, diesel	SUPPORTING CHEMICAL JP 4 (heavy kerosene; Fuel No. 1)	SUPPORTING CHEMICAL JP 8 (kerosene; Fuel Oil No. 1)
CASRN	91770-15-9	101316-80-7	68334-30-5	50815-00-4	82863-50-1
Molecular Weight	Complex mixture with a carbon range of approximately C9 – C16				
Physical State	Liquid				
Melting Point	No data. Typical pour point values for kerosene or jet fuels are <0°C.	No data. Typical pour point values for kerosene or jet fuels are <0°C.	-5°C (measured pour point)[2]; 0°C (measured pour point)[2]; -6°C (measured pour point)[2]; -50 to -14°C (measured pour point)[2]	-46°C (measured pour point)[3]	-50°C (measured pour point)[4]
Boiling Point	152–257°C (measured)	187–288°C (measured)	160–390°C (measured)[2]; 160–400°C (measured)[2]; 141–388°C (measured)[2]	50–270°C (measured)[3]; 90–300°C (measured)[3]; 45–280°C (measured)[3]	150–290°C (measured)[4]
Vapor Pressure	0.03–5.4 mm Hg at 25°C (measured/estimated)[5,6,7]	0.03–5.4 mm Hg at 25°C (measured/estimated)[5,6,7]	3.0 mm Hg at 25°C (measured)[2]; 15.0 mm Hg at 25°C (measured)[2]	91 mm Hg at 20°C (measured)[3]	2.2–26.2 mm Hg at 21°C (measured)
Dissociation Constant (pK_a)	Not applicable				
Henry's Law Constant	0.01–29 atm-m^3/mol (estimated)[5,6]	0.01–29 atm-m^3/mol (estimated)[5,6]	0.14–90.2 atm-m^3/mol (estimated)[5,6]	0.007–2.0 atm-m^3/mol (estimated)[5,6]	0.01–29 atm-m^3/mol (estimated)[5,6]
Water Solubility	0.001–52.2 mg/L at 25°C (measured/estimated)[5,6,7]	0.001–52.2 mg/L at 25°C (measured/estimated)[5,6,7]	1.9×10^{-5} to 3.9 mg/L at 25°C (estimated)[5,6]	0.0044–526 mg/L at 25°C (measured)[5,7]	12.44 mg/L at 25°C (measured)
Log K_{ow}	3.7–8.0 (measured/ estimated)[5,6,7]	3.7–8.0 (measured/ estimated)[5,6,7]	4.5–9.9 (estimated)[5,6]	2.7–5.7 (measured/ estimated)[5,6,7]	3.6–8.1 (measured/ estimated)[5,6,7]

[1] American Petroleum Institute Petroleum HPV Testing Group. 2010. Revised Robust Summary and Test Plan for Kerosene/Jet Fuels available online at http://www.epa.gov/chemrtk/pubs/summaries/kerjetfc/c15020tc.htm as of January 14, 2011.
[2] American Petroleum Institute. 2003. Revised Robust Summary and Test Plan for the Distillate Fuels and Gas Oils Category available online at http://www.epa.gov/oppt/chemrtk/pubs/summaries/gasoilct/c14835tc.htm as of January 14, 2011.
[3] Agency for Toxic Substances and Disease Registry. 2005. Toxicological Profile for Jet Fuels JP-4 and JP-7. Available online at http://www.atsdr.cdc.gov/ToxProfiles/tp.asp?id=768&tid=149 as of January 14, 2011.
[4] Agency for Toxic Substances and Disease Registry. 2005. Toxicological Profile for Jet Fuels JP-5 and JP-8. Available online at http://www.atsdr.cdc.gov/ToxProfiles/tp.asp?id=773&tid=150 as of January 14, 2011.
[5] Data range presented for representative structures provided in the Appendix.
[6] U.S. EPA. 2010. Estimation Programs Interface Suite™ for Microsoft® Windows, v4.00. U.S. Environmental Protection Agency, Washington, DC, USA. Available online at http://www.epa.gov/opptintr/exposure/pubs/episuitedl.htm as of January 14, 2011.
[7] SRC. The Physical Properties Database (PHYSPROP). Syracuse, NY: Syracuse Research Corporation. Available online at http://www.syrres.com/esc/physprop.htm as of January 14, 2011.

Table 2. Physical-Chemical Properties of the Kerosene/Jet Fuels Category[1]			
Property	**SUPPORTING CHEMICAL Jet Propellant 5 (JP-5)**	**SUPPORTING CHEMICAL Jet Fuel B**	**SUPPORTING CHEMICAL Jet Fuel A/A-1 (aviation turbine fuel, kerosene type)**
CASRN	Not applicable	Not applicable	Not applicable
Molecular Weight	Complex mixture with a carbon range of approximately C9 – C16		
Physical State	Liquid		
Melting Point	Less than -48°C (measured pour point)	-50°C(measured pour point)[2]	Less than -47°C (measured pour point)
Boiling Point	150–290°C (measured)[3]	60–260°C (measured)[4]	145–300°C (measured) 188–246°C (measured)[5]; 169–236°C (measured)[5]
Vapor Pressure	2.2–26.2 mm Hg at 21°C (measured)	157.5 mm Hg at 38°C (measured)[2]	>7 mm Hg at 37.8°C (measured)
Dissociation Constant (pK_a)	Not applicable		
Henry's Law Constant	0.01–29 atm-m^3/mol (estimated)[6,7]	0.007–2.0 atm-m^3/mol (estimated)[6,7]	0.01–29 atm-m^3/mol (estimated)[6,7]
Water Solubility	0.001–14.0 mg/L at 25°C (measured/estimated)[6,7,8]	0.0044–526 mg/L at 25°C (measured)[6,8]	0.001–14.0 mg/L at 25°C (measured/estimated)[6,7,8]
Log K_{ow}	3.6–8.1 (measured/estimated)[6,7,8]	2.7–5.7 (measured/estimated)[6,7,8]	3.6–8.1 (measured/estimated)[6,7,8]

[1] American Petroleum Institute Petroleum HPV Testing Group. 2010. Revised Robust Summary and Test Plan for Kerosene/Jet Fuels available online at http://www.epa.gov/chemrtk/pubs/summaries/kerjetfc/c15020tc.htm as of January 14, 2011.
[2] Exxon-Mobile. 2005. World Jet Fuel Specifications with Avgas Supplement. Available online at http://www.exxonmobil.com/AviationGlobal/Files/WorldJetFuelSpecifications2005.pdf as of January 14, 2011.
[3] Agency for Toxic Substances and Disease Registry. 2005. Toxicological Profile for Jet Fuels JP-5 and JP-8. Available online at http://www.atsdr.cdc.gov/ToxProfiles/tp.asp?id=773&tid=150 as of January 14, 2011.
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[6] Data range presented for representative structures provided in the Appendix.
[7] U.S. EPA. 2010. Estimation Programs Interface Suite™ for Microsoft® Windows, v4.00. U.S. Environmental Protection Agency, Washington, DC, USA. Available online at http://www.epa.gov/opptintr/exposure/pubs/episuitedl.htm as of January 14, 2011.
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Table 3. Environmental Fate Properties of the Kerosene/Jet Fuels Category[1]

Property	SPONSORED CHEMICAL Kerosene (petroleum)	SPONSORED CHEMICAL Distillates (petroleum), acid-treated light	SPONSORED CHEMICAL Distillates (petroleum), chemically neutralized light	SPONSORED CHEMICAL Kerosene (petroleum), hydrodesulfurized	SPONSORED CHEMICAL Distillates (petroleum), hydrotreated light	SPONSORED CHEMICAL Solvent naphtha (petroleum), heavy aliph.
CASRN	8008-20-6	64742-14-9	64742-31-0	64742-81-0	64742-47-8	64742-96-7
Photodegradation Half-life	6.4–17.6 hours (estimated)[2,3]	6.4–17.6 hours (estimated)[2,3]	6.4–17.6 hours (estimated)[2,3]	6.4–17.6 hours (estimated)[2,3]	6.4–17.6 hours (estimated)[2,3]	6.4–8.4 hours (estimated)[2,3]
Hydrolysis Half-life	Stable					
Biodegradation	58.6% in 28 days (not readily biodegradable)	No data. Hydrocarbon components in these mixtures are likely to degrade.				
Bioaccumulation Factor	150.2 to 5.7×10^4 (estimated)[2,3]	150.2 to 5.7×10^4 (estimated)[2,3]	150.2 to 5.7×10^4 (estimated)[2,3]	150.2 to 5.7×10^4 (estimated)[2,3]	150.2 to 5.7×10^4 (estimated)[2,3]	710.6 to 5.7×10^4 (estimated)[2,3]
Log K_{oc}	2.9–4.6 (estimated)[2,3]	2.9–4.6 (estimated)[2,3]	2.9–4.6 (estimated)[2,3]	2.9–4.6 (estimated)[2,3]	2.9–4.6 (estimated)[2,3]	3.4–4.6 (estimated)[2,3]
Fugacity (Level III Model)[2,3]						
Air (%)	5.0–26.9	5.0–26.9	5.0–26.9	5.0–26.9	5.0–26.9	5.0–17.8
Water (%)	31.5–69.1	31.5–69.1	31.5–69.1	31.5–69.1	31.5–69.1	27.1–71.4
Soil (%)	1.5–53.8	1.5–53.8	1.5–53.8	1.5–53.8	1.5–53.8	1.5–63.8
Sediment (%)	0.9–25.1	0.9–25.1	0.9–25.1	0.9–25.1	0.9–25.1	3.8–25.1
Persistence[4]	P1 (low) – P2 (moderate)	P1 (low) – P2 (moderate)	P1 (low) – P2 (moderate)	P1 (low) – P2 (moderate)	P1 (low) – P2 (moderate)	P1 (low) – P2 (moderate)
Bioaccumulation[4]	B1 (low) to B3 (high)	B1 (low) to B3 (high)	B1 (low) to B3 (high)	B1 (low) to B3 (high)	B1 (low) to B3 (high)	B1 (low) to B3 (high)

[1] American Petroleum Institute Petroleum HPV Testing Group. 2010. Revised Robust Summary and Test Plan for Kerosene/Jet Fuels available online at http://www.epa.gov/chemrtk/pubs/summaries/kerjetfc/c15020tc.htm as of January 14, 2011.
[2] Data range presented for representative structures provided in the Appendix.
[3] U.S. EPA. 2010. Estimation Programs Interface Suite™ for Microsoft® Windows, v4.00. U.S. Environmental Protection Agency, Washington, DC, USA. Available online at http://www.epa.gov/opptintr/exposure/pubs/episuitedl.htm as of January 14, 2011.
[4] Federal Register. 1999. Category for persistent, bioaccumulative, and toxic new chemical substances. *Federal Register* 64, Number 213 (November 4, 1999) pp. 60194–60204.

Table 3. Environmental Fate Properties of the Kerosene/Jet Fuels Category[1]					
Property	**SUPPORTING CHEMICAL Kerosene (petroleum), sweetened**	**SUPPORTING CHEMICAL Solvent naphtha (petroleum), hydrocracked heavy arom.**	**SUPPORTING CHEMICAL Fuels, diesel**	**SUPPORTING CHEMICAL JP 4 (heavy kerosene; Fuel No. 1)**	**SUPPORTING CHEMICAL JP 8 (kerosene; Fuel Oil No. 1)**
CASRN	91770-15-9	101316-80-7	68334-30-5	50815-00-4	82863-50-1
Photodegradation Half-life	6.4–17.6 hours (estimated)[2,3]	6.4–17.6 hours (estimated)[2,3]	5.0–9.4 hours (estimated)[2,3]	10.2–24.6 hours (estimated)[2,3]	6.6–14.7 hours (estimated)[2,3]
Hydrolysis Half-life	Stable				
Biodegradation	No data. Hydrocarbon components in these mixtures are likely to degrade.	No data. Hydrocarbon components in these mixtures are likely to degrade.	60% in 28 days (not readily biodedegradable)[4]; 57.5% in 28 days (not readily biodegradable)	Half-life of 3.5 weeks in a clay soil at 27°C[5]	Removal of dissolved hydrocarbon components in water soluble fractions of aviation jet fuel (Jet A, Jet A1, and JP-8) was >99% for two dilution rates in a chemostat culture. Degradation observed in non-sterile sediment/water slurries[6]
Bioaccumulation Factor	150.2 to 5.7×10^4 (estimated)[2,3]	150.2 to 5.7×10^4 (estimated)[2,3]	867 to 3.9×10^4 (estimated)[2,3]	37.8 to 2,014 (estimated)[2,3]	316.2 to 1.9×10^6 (estimated)[2,3]
Log K_{oc}	2.9–4.6 (estimated)[2,3]	2.9–4.6 (estimated)[2,3]	2.9–5.6 (estimated)[2,3]	2.4–3.4 (estimated)[2,3]	2.4–4.7 (estimated)[2,3]
Fugacity (Level III Model)[2,3]					
Air (%)	5.0–26.9	5.0–26.9	3.4–20.8	19.0–34.9	2.1–26.9
Water (%)	31.5–69.1	31.5–69.1	19.7–87.4	41.2–72.0	11.9–76.0
Soil (%)	1.5–53.8	1.5–53.8	3.6–54.1	1.2–39.4	1.7–62.2
Sediment (%)	0.9–25.1	0.9–25.1	2.0–22.7	0.4–3.6	0.8–31.6
Persistence[7]	P1 (low) – P2 (moderate)	P1 (low) – P2 (moderate)	P1 (low) – P2 (moderate)	P1 (low) – P2 (moderate)	P1 (low) – P2 (moderate)
Bioaccumulation[7]	B1 (low) to B3 (high)	B1 (low) to B3 (high)	B1 (low) to B3 (high)	B1 (low) to B2 (moderate)	B1 (low) to B3 (high)

1 American Petroleum Institute Petroleum HPV Testing Group. 2010. Revised Robust Summary and Test Plan for Kerosene/Jet Fuels available online at http://www.epa.gov/chemrtk/pubs/summaries/kerjetfc/c15020tc.htm as of January 14, 2011.
2 Data range presented for representative structures provided in the Appendix.
3 U.S. EPA. 2010. Estimation Programs Interface Suite™ for Microsoft® Windows, v4.00. U.S. Environmental Protection Agency, Washington, DC, USA. Available online at http://www.epa.gov/opptintr/exposure/pubs/episuitedl.htm as of January 14, 2011.
4 American Petroleum Institute. 2003. Revised Robust Summary and Test Plan for the Distillate Fuels and Gas Oils Category available online at http://www.epa.gov/oppt/chemrtk/pubs/summaries/gasoilct/c14835tc.htm as of January 14, 2011.
5 Agency for Toxic Substances and Disease Registry. 2005. Toxicological Profile for Jet Fuels JP-4 and JP-7. Available online at http://www.atsdr.cdc.gov/ToxProfiles/tp.asp?id=768&tid=149 as of January 14, 2011.

6 Agency for Toxic Substances and Disease Registry. 2005. Toxicological Profile for Jet Fuels JP-5 and JP-8. Available online at http://www.atsdr.cdc.gov/ToxProfiles/tp.asp?id=773&tid=150 as of January 14, 2011.
7 Federal Register. 1999. Category for persistent, bioaccumulative, and toxic new chemical substances. Federal Register 64, Number 213 (November 4, 1999) pp. 60194–60204.

Table 3. Environmental Fate Properties of the Kerosene/Jet Fuels Category[1]

Property	SUPPORTING CHEMICAL Jet Propellant 5 (JP-5)	SUPPORTING CHEMICAL Jet Fuel B	SUPPORTING CHEMICAL Jet Fuel A/A-1 (aviation turbine fuel, kerosene type)
CASRN	Not applicable	Not applicable	Not applicable
Photodegradation Half-life	6.6–14.7 hours (estimated)[2,3]	10.2–24.6 hours (estimated)[2,3]	10.2–24.6 hours (estimated)[2,3]
Hydrolysis Half-life	Stable		
Biodegradation	Soil microbes were able to degrade JP-5 in cultures inoculated with soil organisms[4]	Removal of dissolved hydrocarbon components in water soluble fractions of aviation jet fuel (Jet A, Jet A1, and JP-8) was >99% for two dilution rates in a chemostat culture.	Removal of dissolved hydrocarbon components in water soluble fractions of aviation jet fuel (Jet A, Jet A1, and JP-8) was >99% for two dilution rates in a chemostat culture.
Bioaccumulation Factor	316.2–1.9×10^6 (estimated)[2,3]	37.8–2,014 (estimated)[2,3]	37.8–2,014 (estimated)[2,3]
Log K_{oc}	2.4–4.7 (estimated)[2,3]	2.4–3.4 (estimated)[2,3]	2.4–3.4 (estimated)[2,3]
Fugacity (Level III Model)[2,3]			
Air (%)	2.1–26.9	19.0–34.9	19.0–34.9
Water (%)	11.9–76.0	41.2–72.0	41.2–72.0
Soil (%)	1.7–62.2	1.2–39.4	1.2–39.4
Sediment (%)	0.8–31.6	0.4–3.6	0.4–3.6
Persistence[5]	P1 (low) – P2 (moderate)	P1 (low) – P2 (moderate)	P1 (low) – P2 (moderate)
Bioaccumulation[5]	B1 (low) to B3 (high)	B1 (low) to B2 (moderate)	B1 (low) to B2 (moderate)

1 American Petroleum Institute Petroleum HPV Testing Group. Revised Robust Summary and Test Plan for Kerosene/Jet Fuels available online at http://www.epa.gov/chemrtk/pubs/summaries/kerjetfc/c15020tc.htm as of January 14, 2011.
2 Data range presented for representative structures provided in the Appendix.
3 U.S. EPA. 2010. Estimation Programs Interface Suite™ for Microsoft® Windows, v4.00. U.S. Environmental Protection Agency, Washington, DC, USA. Available online at http://www.epa.gov/opptintr/exposure/pubs/episuitedl.htm as of January 14, 2011.
4 Agency for Toxic Substances and Disease Registry. 2005. Toxicological Profile for Jet Fuels JP-5 and JP-8. Available online at http://www.atsdr.cdc.gov/ToxProfiles/tp.asp?id=773&tid=150 as of January 14, 2011.
5 Federal Register. 1999. Category for persistent, bioaccumulative, and toxic new chemical substances. *Federal Register* 64, Number 213 (November 4, 1999) pp. 60194–60204.

3. Human Health Hazard

A summary of health effects data submitted for SIDS endpoints is provided in Table 4. The table also indicates where data for tested category members are read-across (RA) to untested members of the category.

Acute Oral Toxicity

Straight run kerosene sample API 83-09 (Kerosene (petroleum), CASRN 8008-20-6)
Sprague-Dawley rats (5/sex) were administered a single dose of undiluted kerosene via oral gavage at 5000 mg/kg and observed for 14 days. No mortalities were observed.
LD_{50} > 5000 mg/kg

The results of two additional acute oral toxicity studies were given, but full robust summaries were not provided. The acute oral LD_{50} is > 5000 mg/kg for the sponsored substance, hydrodesulfurized kerosene API 81-07 (CASRN 64742-81-0), and > 20,000 mg/kg for the supporting substance, jet fuel A (No CASRN).

Acute Dermal Toxicity

Kerosene (petroleum) (CASRN 8008-20-6)
New Zealand White rabbits (2/sex) were administered kerosene (petroleum) via the dermal route at 2000 mg/kg under occlusive conditions for 24 hours. The skin of one rabbit of each sex was left intact and the other was abraded. Rabbits were observed for 14 days. No mortalities were observed.
LD_{50} > 2000 mg/kg

The results of two additional acute dermal toxicity studies were given, but full robust summaries were not provided. The acute dermal LD_{50} values were > 2000 mg/kg for hydrodesulfurized kerosene (CASRN 64742-81-0) and > 4000 mg/kg for jet fuel A (no CASRN).

Acute Inhalation Toxicity

Kerosene (petroleum) (CASRN 8008-20-6)
(1) Sprague-Dawley rats (5/sex) were exposed by whole body inhalation to kerosene (petroleum) vapor at 5.28 mg/L (measured concentration) for 4 hours and observed for 14 days. No mortalities were observed.
LC_{50} > 5.28 mg/L

The results of three additional acute inhalation toxicity studies were given, but full robust summaries were not provided. The acute inhalation LC_{50} in rats for deodorized kerosene (CASRN 8008-20-6) is greater than saturated vapors and > 5.2 mg/L in rats following a 4-hour exposure to hydrodesulfurized kerosene (CASRN 64742-81-0).

Repeated-Dose Toxicity

JP-8 Jet Fuel (No CASRN, supporting chemical)
In a 90-day study, male Sprague-Dawley rats (10/dose) were treated by gavage with 750, 1,500, or 3,000 mg/kg/day undiluted JP-8. Body weight decreased compared to controls at low (6%), mid (13%), and high (43%) dose. Relative liver weight was increased and total bilirubin was increased at all doses in a dose-dependent manner. Relative spleen weight and relative testes weight was increased at 3000 mg/kg/day. No histopathological changes were observed in these organs. An α2μ-globulin nephropathy was observed at all doses and a significant increase in the incidence and severity of chronic progressive nephrosis was observed at 3000 mg/kg/day. Neither of these lesions is considered relevant for human health effects. Urinary pH was significantly decreased at 1,500, and 3,000 mg/kg/day. Blood creatinine was significantly increased compared to controls only at 750 and 1,500 mg/kg/day. There was an increase in incidence and severity of anal hyperplasia and dermatitis in all treated groups compared to controls; the severity of the hyperplasia increased in a dose-dependent manner. Stomach irritation and hyperplasia were observed at all doses. No significant changes were found in red blood cell count, but significant increases in neutrophils and significant decreases in lymphocytes were observed at all doses compared to controls. Platelets were increased at high dose compared to controls. Significant increases in levels of aspartate aminotransferase and alanine aminotransferase occurred but were not dose dependent. Triglycerides were significantly decreased at high dose. A thymus sarcoma was found in 1 of 10 male Sprague-Dawley rats treated with 3,000 mg/kg. See: Mattie et. al., 1995.
LOAEL = 750 mg/kg/day (based on decreased body weight, increased relative liver weight, increased total bilirubin and changes in hematology)
NOAEL = Not established

Hydrodesulfurized kerosene (petroleum) (CASRN 64742-81-0)
Sprague-Dawley rats (12/sex/dose) were administered hydrodesulfurized kerosene (petroleum) via the dermal route at 0 (mineral oil vehicle control), 165, 330 or 495 mg/kg/day (conditions not specified) 5 days/week for 13 weeks. Skin irritation was observed with a dose-related increase in the incidence and severity of erythema, edema, epidermal scaling, scab formation, thickening of the skin and ulceration. Males were more sensitive than females. Histology revealed minimal acanthosis, ulceration, parakeratosis, chronic active inflammation and hyperkeratosis of the skin. No mortalities or effects on body weight, ophthalmic examination, functional observation battery, hematology, clinical chemistry or clinical signs of toxicity were noted. High-dose females had increased absolute and relative spleen weight. No microscopic or clinical chemistry changes were observed.
NOAEL = 495 mg/kg/day (highest dose tested)

Hydrodesulfurized kerosene (petroleum) (CASRN 64742-81-0)
Sprague-Dawley rats (20/sex/dose) were exposed to hydrodesulfurized kerosene (petroleum) [API 81-09] via inhalation as a vapor at 0 (control) and 0.032 mg/L (actual concentration 0.024 mg/L) for 6 hours/day, 5 days/week for 4 weeks. Study data was not provided, but the Robust Summary stated that no treatment-related effects were observed on measured parameters:

mortality, body weight, hematology, clinical signs of toxicity, clinical chemistry, organ weight or histology.
NOAEC = 0.024 mg/L/day (highest concentration tested)

JP-5 Jet Fuel (No CASRN, supporting chemical)
Fischer 344 rats (75/sex/dose) and C57BL/6 mice (111 females/dose) were continuously exposed to JP-5 jet fuel vapor at concentrations of 0 (control), 150 mg/m^3 and 750 mg/m^3 for 90 days. Serum chemistry, organ weights, and histology were measured after 90 days exposure and up to 21 months after exposure. Survival in mice was significantly decreased by 20% at 750 mg/m^3. In male rats, JP-5 produced nephropathy characterized by hyaline droplets, necrosis, and intratubular casts at 750 mg/m^3. Pathological changes in the kidney included accentuated tubular degeneration and medullary mineralization after 21 weeks. JP-5 related renal damage was not observed in female rats. Reduced body weight gains and increased kidney weight occurred in male rats at 750 mg/m^3. After 90 days exposure, red blood cells and hematocrit were reduced, and BUN levels were increased in male rats at 150 mg/m^3 and 750 mg/m^3. Hepatocellular vacuolization and fatty change occurred in exposed rats and mice. Chronic dermal inflammation and ulceration were seen at all concentrations. See: Gaworski et. al., 1985.
LOAEC = 740 mg/m^3/day (based on decreased survival in mice, reduced body weight gain and increased kidney weight in male rats)
NOAEC = 150 mg/m^3/day

JP-8 jet fuel (No CASRN, supporting chemical)
Fischer 344 rats (7-15/sex/group) and C57BL/6 mice (100/sex/dose) were exposed to JP-8 vapors at 0, 500, and 1,000 mg/m^3 on a continuous basis for 90 days and followed during recovery until approximately 24 months of age. A significant decrease in body weight was observed in male rats throughout the study at both doses. Increased absolute and relative kidney weights occurred in male rats at 500 and 1,000 mg/m^3. An increase in urinary renal epithelial cell numbers were noted in male rats at 500 and 1,000 mg/m^3, but this effect was reversible after 2 weeks recovery. The exposed male rats developed distinct renal effects: hyaline droplet formation, granular casts in the outer medulla, and an increase in severe lesions similar to chronic progressive nephrosis consistent with $\alpha 2\mu$-globulin[4]. Dose-dependent mild splenic hematopoesis was noted in female rats. Increased basophilic foci in livers were observed in male rats at both doses. No significant changes in clinical chemistry or hematology occurred in male or female rats. Necrotizing dermatitis associated with fighting resulted in an increase in mortality in mice (male greater than female) during the 2 week to 9 month post-exposure recovery period. No treatment-related toxicity was noted in mice apart from increased mortality resulting from necrotic dermatitis induced by fighting in males. See: Mattie et. al., 1991.
LOAEC = 500 mg/m^3/day (based on decreased body weight gain and increased absolute and relative kidney weights in male rats)
NOAEC = Not established

[4] Nephropathy seen in male rats may be occurring by an alpha 2μ-globulin-mediated mechanism (which is male rat-specific and not considered relevant to humans). EPA's Risk Assessment Forum has outlined key events and data that are necessary to demonstrate this mode of action (Alpha 2μ-Globulin: Association with Chemically Induced Renal Toxicity and Neoplasia in the Rat, EPA/625/3-91/019F).

Reproductive Toxicity

Hydrodesulfurized kerosene (petroleum) (CASRN 64742-81-0)
In a dermal reproductive/developmental toxicity screening test, Sprague-Dawley rats (10/sex/dose) were dermally exposed to 0, 165, 330 and 494 mg/kg/day (0, 20, 40, or 60% v/v in mineral oil) hydrodesulfurized kerosene (petroleum) on unoccluded skin from 14 days premating through gestation day 20 (6 hours/day during mating). Males continued treatment until sacrifice of females on postnatal day 4-6. One pregnant female at 330 mg/kg/day died before delivery, but this was unrelated to treatment. No clinical signs of toxicity were observed. Weight gain was decreased and relative kidney weight was increased in males at 494 mg/kg/day. Mild to moderate skin irritation and histological changes at the application site were observed in males and females at the highest dose. Body weight gain was decreased and relative kidney weight was increased in males at 494 mg/kg/day. No treatment-related changes in the male testes or epididymides or female ovaries were observed.
NOAEL (reproductive toxicity) = 494 mg/kg/day (highest dose tested)

Developmental Toxicity

Hydrodesulfurized kerosene (petroleum) (CASRN 64742-81-0)
In the dermal reproductive/developmental toxicity screening test described above, Sprague-Dawley survival of rat pups was decreased at 494 mg/kg/day during days 1-4 after birth. However, this appeared to be due to malfunction of a water bottle in one cage; exclusion of this litter from the analysis resulted in no significant difference in survival from controls. No other adverse developmental effects were observed.
NOAEL (maternal toxicity) = 494 mg/kg/day (highest dose tested)
NOAEL (developmental toxicity) = 494 mg/kg/day (highest dose tested)

Kerosene (petroleum) (CASRN 8008-20-6)
In an inhalation developmental toxicity study, female Sprague-Dawley rats (20/dose) were exposed to 0, 100, or 400 ppm (actual concentrations 106 and 364 ppm) kerosene vapor for 6 hours/day on days 6-15 of gestation. No deaths or clinical signs were observed in dams. Two rats at 100 ppm had mottled lungs, but this was not considered treatment-related. No differences in body weight or food consumption were observed. There were no effects on implantations, resorptions, litter size, fetal weight, fetal death, sex ratio, skeletal or visceral anomalies.
NOAEC (maternal toxicity) = 364 ppm/day (highest concentration tested)
NOAEC (developmental toxicity) = 364 ppm/day (highest concentration tested)

Jet Fuel A (No CASRN, supporting chemical)
In a prenatal developmental toxicity study, pregnant female Sprague-Dawley rats (5/sex) were exposed (whole-body) to jet fuel A as a vapor at nominal concentrations of 100 or 400 ppm (measured concentrations 102.5 and 394.7 ppm) 6 hours/day on days 6 – 15 of gestation. Clinical signs of toxicity included eye irritation consisting of discharge from the eye, swollen eyelids or swollen areas around the eye, which occurred in a dose-related manner. No mortality or effects on body weight or food consumption were noted. No reproductive/developmental

effects were noted for mean live litter size, skeletal malformations, pup sex ratio, dead fetuses, implantation sites, resorptions, nidation index or average fetal weight.
NOAEC (maternal toxicity) = 394.7 ppm/day (highest concentration tested)
NOAEC (developmental toxicity) = 394.7 ppm/day (highest concentration tested)

JP-8 Jet Fuel (No CASRN, supporting chemical)
Pregnant rats were treated with 0, 500, 1000, 1500, or 2000 mg/kg/day JP-8 once a day by gavage during gestational days 6–15. No treatment-related deaths occurred in pregnant rats treated once a day with up to 2000 mg/kg/day JP-8 by gavage during gestational days 6-l5 (Cooper and Mattie 1996). Maternal body weight gain was significantly decreased by 3l%, 70%, and 85% at 1000, 1500, and 2000 mg/kg/day, respectively compared to controls. Adjusted maternal body weight (the maternal body weight minus the gravid uterine weight) was significantly decreased compared to controls at 1500 and 2000 mg/kg/day. Decreased fetal body weight was observed in both sexes (15% decrease in males; 13% decrease in females) compared to controls at 1500 mg/kg/day. A dose-dependent increase in overall incidence of fetal alterations occurred at 500 and 1500 mg/kg/day, but not at 2000 mg/kg/day; the number and type of fetal malformations and variations did not differ significantly between groups (Cooper and Mattie, 1996).
LOAEL (maternal toxicity) = 1000 mg/kg/day (based on decreased maternal body weight gain)
NOAEL (maternal toxicity) = 500 mg/kg/day
LOAEL (developmental toxicity) = 1500 mg/kg/day (based on decreased fetal body weight)
NOAEL (developmental toxicity) = 1000 mg/kg/day

Genetic Toxicity – Gene Mutation

In vitro

Hydrodesulfurized kerosene sample API 81-07 (CASRN 34742-81-0)
Mouse lymphoma L5178Y cells were exposed to hydrodesulfurized kerosene sample API 81-07 in ethanol for 4 hours at concentrations of 0, 6.25, 12.5, 25, and 37.5 nl/ml in the presence or absence of metabolic activation. Positive and negative controls produced the expected results. The test substance did not increase mutation frequency in the presence or absence of metabolic activation.
CASRN 34742-81-0 was not mutagenic in this assay.

Kerosene, straight run API sample 83-09 (CASRN 64742-81-0)
Mouse lymphoma L5178Y cells were exposed to API sample 83-09 at test concentrations between 0.0067 and 0.5 μl/ml with and without metabolic activation. The result is reported as positive, but no other details are provided.
CASRN 64742-81-0 was mutagenic in this assay.

Kerosene, straight run (CASRN 64742-81-0)
Mouse lymphoma L5178Y cells were exposed to straight run kerosene at concentrations with (0.004 to 0.065 μl/ml) and without (0.006 to 0.13 μl/ml) metabolic activation. Cytotoxicity

occurred at 0.13 μl/ml. The test substance did not increase mutation frequency in the presence or absence of metabolic activation. Other details were not provided.
CASRN 64742-81-0 was not mutagenic in this assay.

Jet Fuel A (No CASRN)
Mouse lymphoma L5178Y cells were exposed to Jet Fuel A at concentrations of 25 to 200 μg/ml with metabolic activation and 100 to 1200 μg/ml without metabolic activation. The result is reported as positive in the activation assay and negative in the non-activation assay. Other details were not provided.
Jet Fuel A was mutagenic only with metabolic activation in this assay.

Genetic Toxicity – Chromosomal Aberrations

In vitro

Hydrodesulfurized kerosene sample API 81-07 (CASRN 34742-81-0)
Chinese Hamster Ovary cells were treated with 0, 0.007, 0.013, 0.025 and 0.05 μl/ml of hydrodesulfurized kerosene in acetone in the presence and absence of metabolic activation. Positive controls responded as expected. Significantly increased incidence of sister chromatid exchange was seen in non-adjacent doses, but this was believed to be incidental. There was no increase in SCE in the presence or absence of metabolic activation.
CASRN 34742-81-0 did not induce chromosomal aberrations in vitro.

In vivo
Hydrodesulfurized kerosene (CASRN 34742-81-0)
B6C3F1 mice (5/sex/dose) were administered hydrodesulfurized kerosene in corn oil via the intraperitoneal route at 0, 400, 2000 or 4000 mg/kg-bw. Negative and positive controls produced appropriate responses. Statistically significant increases in chromosomal aberrations were observed in males at 400 and 2000 mg/kg-bw ($p < 0.01$) and 4000 mg/kg-bw ($p < 0.05$).
CASRN 34742-81-0 induced chromosomal aberrations in this assay.

Hydrodesulfurized kerosene, sample API 81-07 (CASRN 34742-81-0)
In a cytogenetics study, Sprague-Dawley rats (15/sex/dose) were administered a single intraperitoneal dose of 0, 0.3, 1 or 3 g/kg hydrodesulfurized kerosene and examined at 6, 24 and 48 hours after dosing. Positive control animals (5/sex) were administered 0.8 mg/kg triethylenemelamine (TEM)i.p. No difference between males and females was seen, so the data were pooled. The positive and negative controls behaved as expected. There was no increase in structural aberration frequency with the test substance.
CASRN 34742-81-0 did not induce chromosomal aberrations in this assay.

Jet Fuel A (No CASRN, supporting chemical)
Sprague-Dawley rats (five males) were exposed to jet fuel A as a vapor at 0 or 100 ppm for 6 hours/day for 20 days or 400 ppm for 6 hours/day for 5 days. No information on the use or response of positive controls was provided. Metaphases were observed for the presence of cytogenetic abnormalities, mitotic index and modal number. Clinical signs following exposure

to 400 ppm included decreased body weight, restlessness, agitation, irritation of the muzzle area and respiratory distress. At 100 ppm, nasal discharge, sneezing and slight reductions in body weight gain were observed. Total aberrations for both the treated groups were markedly greater than controls. There was a difference between control and the 400 ppm group for mean model number. There were no differences in the mean mitotic indices.
Jet fuel A induced chromosomal aberrations in this assay.

Additional Information

Skin Irritation

Kerosene (petroleum) (CASRN 8008-20-6)
Six rabbits (sex not specified) were administered 0.5 mL kerosene (petroleum) to two areas of shaved skin, intact and abraded, under occlusive conditions for 24 hours. Erythema and edema was evaluated at 24, 72, and 96 hours, 7 and 14 days after exposure. Kerosene produced moderate to severe irritation up to 7 days after exposure.
Kerosene (petroleum) was irritating to rabbit skin.

Robust summaries were not provided for six additional skin irritation studies for hydrodesulfurized kerosene (CASRN 64742-81-0), odorless kerosene (assumed to be deodorized kerosene), kerosene SG (no CASRN), Jet A-1 (no CASRN) and Jet Fuel A (no CAS number provided). The results ranged from mild irritation during 4-hour applications to moderate or severe irritation to longer 24-hour applications.

Eye Irritation

Kerosene (petroleum) (CASRN 8008-20-6)
Undiluted kerosene (petroleum) (0.1 mL) was instilled onto the corneal surface of one eye of each of nine rabbits. The eyes of three rabbits were washed after 20 – 30 seconds. Eyes were examined at 1, 24, 48 and 72 hours and 7 days post-application. The primary irritation scores recorded at 1 hour were 0.7 in unwashed eyes and 2.0 in washed eyes.
Kerosene (petroleum) was mildly irritating to rabbit eyes.

Sensitization

Kerosene (petroleum) (CASRN 8008-20-6)
Guinea pigs (10, sex not specified) were treated with 0.4 mL undiluted kerosene (petroleum) under an occlusive dressing on the shaved skin for 6 hours. After application, the skin was wiped. Animals received one application once a week for 3 weeks. Due to severe skin irritation, the third dose was applied to a different area of skin. Two weeks following the third application, a challenge dose (0.4 mL of a 1% solution in paraffin oil) was applied in the same manner as the previous doses. No sensitization was noted in the test animals, but positive and negative controls responded as expected.
Kerosene (petroleum) was not a dermal sensitizer in guinea pigs.

Immunotoxicity

Jet Fuel A (No CASRN, supporting chemical)
Female Sprague Dawley rats (10/dose) were treated with 0, 165, 330, or 495 mg/kg/day Jet A in mineral oil by dermal application to the unoccluded skin for 28 days. Cyclophosphamide and anti-asialo GM1 were also administered as positive controls. A screening battery of functional assays standardized by NTP was used to assess immunotoxicity. Dermal exposure of rats to Jet A did not result in alterations in spleen or thymus weights, splenic lymphocyte subpopulations, immunoglobulin (Ig) M antibody-forming cell response to the T-dependent antigen, sheep red blood cells (sRBC), spleen cell proliferative response to anti-CD3 antibody, or natural killer (NK) cell activity. In each assay, the positive controls produced the expected results. See Mann et al. 2008.
Jet Fuel A was not immunotoxic in this study.

JP-8 Jet Fuel (No CASRN, supporting chemical)
(1) Pregnant female C57BL/6 mice were gavaged daily on gestation days 6–15 with JP-8 in olive oil at 0, 1000 or 2000 mg/kg and mated with C3H/HeJ males. No significant differences were observed in body, liver, spleen or thymus weight, splenic and thymic cellularity, splenic CD4/CD8 lymphocyte subpopulations, or T-cell proliferation in offspring at 3 weeks of age. Lymphocytic proliferative responses to B-cell mitogens were suppressed in the 2000 mg/kg treatment group, and thymic CD4−/CD8+ cells were significantly increased, but returned to normal at 8 weeks. Splenic weight and thymic cellularity were altered, and the IgM plaque forming cell response was suppressed by 46% and 81% in the 1000 and 2000 mg/kg treatment groups, respectively. A 38% decrease was detected in the total T4 serum hormone level at 2000 mg/kg. In adult offspring, no significant changes were observed in natural killer cell activity, T-cell lymphocyte proliferation, bone marrow cellularity and proliferative responses, complete blood counts, peritoneal and splenic cellularity, liver, kidney or thymus weight, macrophage phagocytosis or nitric oxide production, splenic CD4/CD8 lymphocyte subpopulations, or total T3 serum hormone levels. Immunological responses were normal after challenge with Listeria monocytogenes, but heightened susceptibility to B16F10 tumor challenge was seen at both doses. Reviewed in Mattie et al., 2011.
JP-8 Jet Fuel was immunotoxic in this study.

(2) Adult female B6C3F1 mice were gavaged with JP-8 in olive oil vehicle at doses ranging from 250–2500 mg/kg/day for 14 days. Significantly increased liver mass occurred at 1000 mg/kg/day and higher and thymic mass was decreased at 1500 mg/kg/day and higher. Decreased thymic cellularity was observed at 2000 mg/kg/day and higher. Mean corpuscular volume was increased at 1500–2500 mg/kg/day and the hematocrit, hemoglobin concentration and red blood cell count were decreased at 2500 mg/kg/day. Natural killer cell (NK) activity and Tand B-cell proliferation were not altered. Decreased plaque forming cell (PFC) responses occurred at 500 mg/kg/day and greater, but there was no change in serum levels of anti-SRBC immunoglobulinM (IgM). Alterations were detected in thymic and splenic CD4/8 subpopulations, and proliferative responses of bone marrow progenitor cells were enhanced in mice exposed to 2000 mg/kg/day. Reviewed in Mattie et al., 2011.
JP-8 Jet Fuel was immunotoxic in this study.

Carcinogenicity

Straight run kerosene (petroleum) (CASRN 64742-81-0)
CH3 mice (50 males/dose) were administered kerosene (petroleum) via the dermal route at 0 (mineral oil control), 28.5% 50 µL 7 days/week, 50% 50 µL 4 days/week or 100% 50 µL 2 days/week for 104 weeks. The control group was dosed for 7 days/week. Undiluted 100% kerosene applied twice weekly to the skin caused skin irritation and skin tumors in 12/50 mice. No tumors developed in the absence of skin irritation. There were no other clinical findings, effects, on body weight, or pathological effects. Carcinogenicity is considered secondary to skin irritation.
CASRN 8008-20-6 showed evidence of carcinogenicity (tumor promotion) in mice.

JP-5 Jet Fuel (No CSARN, supporting chemical)
B6C3F1 mice (50/sex/dose) were dermally administered 0, 250 or 500 mg/kg JP-5 jet fuel in acetone to skin for 2 years. Female mice at 500 mg/kg were sacrificed early because of excessive irritation and ulceration at the application site. Survival was significantly decreased in females at 250 mg/kg (33/50) compared to controls (44/50) at the end of the study. Body weight gain was reduced in male and female mice after 30 weeks at 500 mg/kg. Dose-related increases in chronic dermatitis occurred at both doses, but no evidence of carcinogenicity was observed (NTP study is available at: http://ntp.niehs.nih.gov/ntp/htdocs/LT_rpts/tr310.pdf)..
JP-5 showed no evidence of carcinogenicity in mice.

Conclusion: Acute oral and dermal toxicity are low and acute inhalation toxicity is moderate for CASRNs 8008-20-6 and 64742-81-0. Repeated oral exposure of rats to the supporting chemical JP-8 Jet Fuel (No CASRN) by gavage resulted in a dose-dependent decrease in body weight, increased relative liver weight, increased total bilirubin, and hematological changes at 750 mg/kg-bw/day, the lowest dose tested; the NOAEL was not established. Repeated dermal exposure of rabbits to CASRN 8008-20-6 for 4 weeks showed decreased red blood cell count in males and increased absolute and relative spleen weight in females at 200 mg/kg-bw/day, the lowest dose tested; the NOAEL for systemic toxicity was not established. Repeated dermal exposure of rats to CASRN 64742-81-0 for 13 weeks resulted in skin irritation, histological effects on skin and increased absolute and relative spleen weight in females at 495 mg/kg-bw/day; the NOAEL is 330 mg/kg-bw/day. Repeated inhalation exposure of rats to CASRN 64742-81-0 for 4 weeks showed no adverse effects at 0.024 mg/L; the NOAEC is 0.024 mg/L/day (highest concentration tested). In a reproductive/developmental toxicity screening study, dermal exposure of rats to CASRN 64742-81-0 showed reduced body weight gain and relative kidney weight in males at 494 mg/kg/day, but produced no effects on testes, epididymides or ovaries; the NOAEL for reproductive toxicity is 494 mg/kg/day (highest dose tested). In the same study, no effects were observed on maternal or developmental toxicity; the NOAEL for maternal/developmental toxicity is 494 mg/kg/day (highest dose tested). In a prenatal inhalation developmental toxicity study, exposure to CASRN 8008-20-6 vapors caused no effects on dams or fetuses; the NOAEC for maternal and developmental toxicity is 364 ppm/day (highest concentration tested). CASRN 64742-81-0 and the supporting chemical jet fuel A (No CASRN) induced chromosomal aberrations in rats and mice. Repeated dermal exposures of male mice to CASRN 8008-20-6 for 2 years led to increased incidence of dermal irritation and tumors only in the presence of chronic skin irritation. The supporting chemical, JP-5 jet fuel (No

CASRN), did not demonstrate evidence of carcinogenicity in mice following dermal exposure for 2 years. CASRN 8008-20-6 is irritating to rabbit skin and eyes and is not a dermal sensitizer in guinea pigs.

5. References

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Table 4. Summary Table of the Screening Information Data Set as Submitted under the U.S. HPV Challenge Program - Human Health Data

Endpoints	SPONSORED CHEMICAL Kerosene (petroleum) (8008-20-6)	SPONSORED CHEMICAL Acid treated light distillate, light (64742-14-9)	SPONSORED CHEMICAL Chemically neutralized light distillates (petroleum) (64742-31-0)	SPONSORED CHEMICAL Hydrotreated light distillates (petroleum) (64742-47-8)	SPONSORED CHEMICAL Kerosene, hydro-desulfurized (64742-81-0)	SPONSORED CHEMICAL Heavy aliphatic solvent (64742-96-7)	SUPPORTING CHEMICAL Jet fuel A /A-1 (No CASRN)	SUPPORTING CHEMICAL JP 5 Jet Fuel (No CASRN)	SUPPORTING CHEMICAL JP 8 Jet Fuel (No CASRN)	SUPPORTING CHEMICAL JP 4 Fuel (No CASRN)
Acute Oral Toxicity LD_{50} (mg/kg)	**> 5000**	No Data > 5000 (RA)	No Data > 5000 (RA)	No Data > 5000 (RA)	**> 5000**	No Data > 5000 (RA)	**> 20,000**	–	–	–
Acute Inhalation Toxicity LC_{50} (mg/L)	**> 5.28**	No Data > 5.2 (RA)	No Data > 5.2 (RA)	No Data > 5.2 (RA)	**> 5.2**	No Data > 5.2 (RA)	–	–	–	–
Acute Dermal Toxicity LD_{50} (mg/kg)	**> 2000**	No Data > 2000 (RA)	No Data > 2000 (RA)	No Data > 2000 (RA)	**> 2000**	No Data > 2000 (RA)	**> 4000**	–	–	–
Repeated-Dose Toxicity NOAEL/LOAEL Oral (mg/kg-bw/day)	No Data NOAEL = Not established LOAEL = 750 (RA)	No Data NOAEL = Not established LOAEL = 750 (RA)	No Data NOAEL = Not established LOAEL = 750 (RA)	No Data NOAEL = Not established LOAEL = 750 (RA)	No Data NOAEL = Not established LOAEL = 750 (RA)	No Data NOAEL = Not established LOAEL = 750 (RA)	–	–	NOAEL = Not established LOAEL = 750	–
Repeated-Dose Toxicity NOAEC/LOAEC Inhalation (mg/L/day)	No Data NOAEC = 0.024 (RA)	No Data NOAEC = 0.024 (RA)	No Data NOAEC = 0.024 (RA)	No Data NOAEC = 0.024 (RA)	**(28-d) NOAEC = 0.024 (highest concentration tested)**	No Data NOAEC = 0.024 (RA)	–	**(90-d) NOAEC = 0.15 LOAEC = 0.74**	**(90-d) NOAEC = Not established LOAEC = 0.50**	**(12 month) NOAEC = Not established LOAEC = 1.00**

Table 4. Summary Table of the Screening Information Data Set as Submitted under the U.S. HPV Challenge Program - Human Health Data

Endpoints	SPONSORED CHEMICAL Kerosene (petroleum) (8008-20-6)	SPONSORED CHEMICAL Acid treated light distillate, light (64742-14-9)	SPONSORED CHEMICAL Chemically neutralized light distillates (petroleum) (64742-31-0)	SPONSORED CHEMICAL Hydrotreated light distillates (petroleum) (64742-47-8)	SPONSORED CHEMICAL Kerosene, hydro-desulfurized (64742-81-0)	SPONSORED CHEMICAL Heavy aliphatic solvent (64742-96-7)	SUPPORTING CHEMICAL Jet fuel A /A-1 (No CASRN)	SUPPORTING CHEMICAL JP 5 Jet Fuel (No CASRN)	SUPPORTING CHEMICAL JP 8 Jet Fuel (No CASRN)	SUPPORTING CHEMICAL JP 4 Fuel (No CASRN)
Repeated-Dose Toxicity NOAEL/LOAEL Dermal (mg/kg-bw/day)	**NOAEL = Not established LOAEL = 200**	No data NOAEL = Not **established** LOAEL = 200 (RA)	No data NOAEL = Not **established** LOAEL = 200 (RA)	No data NOAEL = Not **established** LOAEL = 200 (RA)	**NOAEL = 330 LOAEL = 495**	No data NOAEL = Not **established** LOAEL = 200 (RA)	–	–	–	–
Reproductive Toxicity Dermal (mg/kg-bw/day)	No Data NOAEL = 494 (RA)	No Data NOAEL = 494 (RA)	No Data NOAEL = 494 (RA)	No Data NOAEL = 494 (RA)	**NOAEL = 494 (highest dose tested)**	No Data NOAEL= 494 (RA)	–	–	–	–
Developmental Toxicity NOAEL/LOAEL Inhalation (ppm/day)								–	–	–
Maternal Toxicity	**NOAEC = 364 (highest concentration tested)**	No Data NOAEC = 364	No Data NOAEC= 364	No Data NOAEC = 364	No Data NOAEC = 364	No Data NOAEC = 364	**NOAEC = 394.7 (highest concentration tested)**			
Developmental Toxicity	**NOAEC = 364 (highest dose tested)**	NOAEC = 364 (RA)	NOAEC = 364 (RA)	NOAEC = 364 (RA)	NOAEC = 364 (RA)	NOAEC = 364 (RA)	**NOAEC = 394.7 (highest concentration tested)**			

Table 4. Summary Table of the Screening Information Data Set as Submitted under the U.S. HPV Challenge Program - Human Health Data

Endpoints	SPONSORED CHEMICAL Kerosene (petroleum) (8008-20-6)	SPONSORED CHEMICAL Acid treated light distillate, light (64742-14-9)	SPONSORED CHEMICAL Chemically neutralized light distillates (petroleum) (64742-31-0)	SPONSORED CHEMICAL Hydrotreated light distillates (petroleum) (64742-47-8)	SPONSORED CHEMICAL Kerosene, hydro-desulfurized (64742-81-0)	SPONSORED CHEMICAL Heavy aliphatic solvent (64742-96-7)	SUPPORTING CHEMICAL Jet fuel A /A-1 (No CASRN)	SUPPORTING CHEMICAL JP 5 Jet Fuel (No CASRN)	SUPPORTING CHEMICAL JP 8 Jet Fuel (No CASRN)	SUPPORTING CHEMICAL JP 4 Fuel (No CASRN)
Developmental Toxicity NOAEL/LOAEL Oral (mg/kg/day)							–	–		–
Maternal Toxicity	No Data NOAEL = 500 LOAEL = 1000 (RA)	No Data NOAEL = 500 LOAEL = 1000 (RA)	No Data NOAEL = 500 LOAEL = 1000 (RA)	No Data NOAEL = 500 LOAEL = 1000 (RA)	No Data NOAEL = 500 LOAEL = 1000 (RA)	No Data NOAEL = 500 LOAEL = 1000 (RA)			**NOAEL = 500 LOAEL = 1000**	
Developmental Toxicity	No Data NOAEL = 1000 LOAEL = 1500 (RA)	No Data NOAEL = 1000 LOAEL = 1500 (RA)	No Data NOAEL = 1000 LOAEL = 1500 (RA)	No Data NOAEL = 1000 LOAEL = 1500 (RA)	No Data NOAEL = 1000 LOAEL = 1500 (RA)	No Data NOAEL = 1000 LOAEL = 1500 (RA)			**NOAEL = 1000 LOAEL = 1500**	
Developmental Toxicity NOAEL/LOAEL Dermal (mg/kg-bw/day)							–	–	–	–
Maternal Toxicity	No Data NOAEL = 494 (RA)	No Data NOAEL = 494 (RA)	No Data NOAEL = 494 (RA)	No Data NOAEL = 494 (RA)	**NOAEL = 494 (highest dose tested)**	No Data NOAEL = 494 (RA)				
Developmental Toxicity	No Data NOAEL = 494 (RA)	No Data NOAEL = 494 (RA)	No Data NOAEL = 494 (RA)	No Data NOAEL = 494 (RA)	**NOAEL = 494 (highest dose tested)**	No Data NOAEL = 494 (RA)				

Table 4. Summary Table of the Screening Information Data Set as Submitted under the U.S. HPV Challenge Program - Human Health Data

Endpoints	SPONSORED CHEMICAL Kerosene (petroleum) (8008-20-6)	SPONSORED CHEMICAL Acid treated light distillate, light (64742-14-9)	SPONSORED CHEMICAL Chemically neutralized light distillates (petroleum) (64742-31-0)	SPONSORED CHEMICAL Hydrotreated light distillates (petroleum) (64742-47-8)	SPONSORED CHEMICAL Kerosene, hydro-desulfurized (64742-81-0)	SPONSORED CHEMICAL Heavy aliphatic solvent (64742-96-7)	SUPPORTING CHEMICAL Jet fuel A /A-1 (No CASRN)	SUPPORTING CHEMICAL JP 5 Jet Fuel (No CASRN)	SUPPORTING CHEMICAL JP 8 Jet Fuel (No CASRN)	SUPPORTING CHEMICAL JP 4 Fuel (No CASRN)
Genetic Toxicity – Gene Mutation ***In vitro***	**Positive**	No Data Positive (RA)	No Data Positive (RA)	No Data Positive (RA)	**Negative**	No Data Positive (RA)	**Positive w/ activation only**	**Negative**	–	–
Genetic Toxicity – Chromosomal Aberrations ***In vitro***	No Data Negative (RA)	No Data Negative (RA)	No Data Negative (RA)	No Data Negative (RA)	**Negative**	No Data Negative (RA)	–	–	–	–
Genetic Toxicity – Chromosomal Aberrations ***In vivo***	No Data Positive (RA)	No Data Positive (RA)	No Data Positive (RA)	No Data Positive (RA)	**Positive**	No Data Positive (RA)	**Positive**	–	–	–
Additional Information										
Skin Irritation	**Moderately irritating**	–	–	–	**Moderately irritating**	–	**Moderately irritating**	–	–	–
Eye Irritation	**Mildly irritating**	–	–	–	–	–	–	–	–	–
Sensitization	**Not sensitizing**	–	–	–	–	–	–	–	–	–
Immunotoxicity	–	–	–	–	–	–	**Not immunotoxic**	–	**Immunotoxic**	–
Carcinogenicity	–	–	–	–	**Positive only with chronic irritation**	–	–	**Negative**	–	–

Measured data in bold text; (RA) = Read Across; – indicates endpoint not addressed for this chemical

4. Hazard to the Environment

There were no adequate data submitted for the sponsored chemicals. A summary of aquatic toxicity data for supporting chemicals for SIDS endpoints is provided in Table 5. The table also indicates where test data are read-across (RA) to the sponsored chemicals of the kerosene/jet fuel category.

Acute Toxicity to Fish

C7-C10 Isoalkane Hydrocarbons (CASRN 90622-56-3, supporting chemical)
Rainbow trout (*Oncorhynchus mykiss*) were exposed to Water Accomodated Fractions (WAFs) of CASRN 90622-56-3 at nominal loading rates of 0, 0.9, 2.0, 10.0, 22.0 or 50.0 mg/L under static-renewal conditions for 96 hours. Corresponding time-weighted mean measured concentrations were 0, 0.05, 0.12, 0.33, 0.36 and 0.47 mg/L.
96-h LC_{50} = 0.11 mg/L

C8-C9 Cyclic Hydrocarbons (CASRN 64742-48-9, supporting chemical)
Rainbow trout (*Oncorhynchus mykiss*) were exposed to WAFs of 64742-48-9 at nominal loading rates of 1.0, 2.3, 5.1, 11.0 or 25.0 mg/L under static-renewal conditions for 96 hours. Corresponding time-weighted mean measured concentrations were 0, 0.05, 0.12, 0.33, 0.36 and 0.47 mg/L.
96-h LC_{50} = 0.3 mg/L

1-Tetradecene (CASRN 1120-36-1, supporting chemical)
http://www.chem.unep.ch/irptc/sids/OECDSIDS/AOalfaolefins.pdf
96-h EC_{50} = No effects at saturation

1-Hexadecene (CASRN 629-73-2, supporting chemical)
http://www.chem.unep.ch/irptc/sids/OECDSIDS/HigherOlefins.pdf
96-h LC_{50} > Predicted Solubility limit (0.00144 mg/L)

Acute Toxicity to Aquatic Invertebrates

C9-C10 Hydrocarbons, n-alkanes, isoalkanes, cyclics, <2% aromatics (CASRN 64742-49-0, supporting chemical)
Water fleas (*Daphnia magna*) were exposed to CASRN 64742-49-0 at nominal loading rates of 0, 1, 2.2, 4.6, 10, 22, 46 or 100 mg/L for 48 hours under static conditions. The corresponding measured concentrations were 0, 0.11, 0.22, 0.18, 0.25, 0.44, 0.47 and 0.56 mg/L, respectively, based upon the geometric mean of the 0 and 48 hour samples.
48-h EC_{50} = 0.9 mg/L

1-Tetradecene (CASRN 1120-36-1, supporting chemical)
http://www.chem.unep.ch/irptc/sids/OECDSIDS/AOalfaolefins.pdf
48-h EC_{50} = No effects at saturation

1-Hexadecene (CASRN 629-73-2, supporting chemical)
http://www.chem.unep.ch/irptc/sids/OECDSIDS/HigherOlefins.pdf
96-h LC_{50} > Predicted Solubility limit (0.00144 mg/L)

Toxicity to Aquatic Plants

C9-C10 Hydrocarbons, n-alkanes, isoalkanes, cyclics, <2% aromatics (CASRN 64742-49-0, supporting chemical)
Green algae (*Pseudokirchneriella subcapitata*) were exposed to CASRN 64742-49-0 at nominal loading rates of 0, 1, 3, 10, 30, 100, 300 or 1000 mg/L for 72-hours under static conditions. Corresponding mean measured concentrations were <0.02, 0.13, 0.11, 0.31, 0.33, 0.36, 0.37 and 0.40 mg/L.
72-h EC_{50} (biomass) = 0.4 mg/L
72-h EC_{50} (growth rate) > 0.4 mg/L

1-Tetradecene (CASRN 1120-36-1)
http://www.chem.unep.ch/irptc/sids/OECDSIDS/AOalfaolefins.pdf
48-h LC_{50} = No effects at saturation

1-Hexadecene (CASRN 629-73-2, supporting chemical)
http://www.chem.unep.ch/irptc/sids/OECDSIDS/HigherOlefins.pdf
72-h EC_{50} (biomass) > Predicted Solubility limit (0.00144 mg/L)
72-h EC_{50} (growth rate) > Predicted Solubility limit (0.00144 mg/L)

Chronic Toxicity to Aquatic Invertebrates

C9-C10 Hydrocarbons, n-alkanes, isoalkanes, cyclics, <2% aromatics (CASRN 64742-49-0, supporting chemical)
Water fleas (*D. magna*) were exposed to CASRN 64742-49-0 at nominal loading rates of 0, 1, 4, 8 or 10 mg/L for 21-days under static-renewal conditions. Corresponding mean measured concentrations were 0, 0.17, 0.32, 0.79, 1.1 and 1.2 mg/L.
21-d NOEC = 0.17 mg/L
21-d LOEC = 0.32 mg/L

1-Tetradecene (CASRN 1120-36-1)
http://www.chem.unep.ch/irptc/sids/OECDSIDS/AOalfaolefins.pdf
ChV = No effects at saturation

Conclusion: No adequate data are available for the sponsored substances. Based on the supporting chemicals, CASRNs 90622-56-3, 64742-48-9, 1120-36-1 and 629-73-2, the 96-h LC_{50} for fish is 0.11 mg/L, the 48-h EC_{50} for aquatic invertebrates is 0.9 mg/L and the 72-h EC_{50} for aquatic plants is 0.4 mg/L for biomass and >0.4 mg/L for growth rate. Based on the supporting chemicals, CASRN 64742-49-0 and 1120-36-1, the 21-d chronic NOEC/LOEC for aquatic invertebrates is 0.17 mg/L and 0.32 mg/L, respectively.

Table 5. Summary of the Screening Information Data Set as Submitted under the U.S. HPV Challenge Program – Aquatic Toxicity Data				
Endpoint	**Fish 96-h LC_{50} (mg/L)**	**Aquatic Invertebrates 48-h EC_{50} (mg/L)**	**Aquatic Plants 72-h EC_{50} (mg/L) Biomass Growth Rate**	**Chronic Aquatic Invertebrates 21-d ChV (mg/L) NOEC/LOEC**
SUPPORTING CHEMICAL C7-C9 Aliphatic Hydrocarbons (64742-48-9, 64742-49-0 & 90622-56-3)	**0.11**	**0.9**	**0.4 >0.4**	**0.17 0.32**
SPONSORED CHEMICAL Kerosene, C9-C16 (8008-20-6)	No Data 0.11 (RA)	No Data 0.9 (RA)	No Data 0.4 >0.4 (RA)	No Data 0.17 - (RA)
SPONSORED CHEMICAL Acid treated light distillate, light C9-C16 (64742-14-9)	No Data 0.11 (RA)	No Data 0.9 (RA)	No Data 0.4 >0.4 (RA)	No Data 0.17 - (RA)
SPONSORED CHEMICAL Chemically neutralized light distillates C9-C16 (64742-31-0)	No Data 0.11 (RA)	No Data 0.9 (RA)	No Data 0.4 >0.4 (RA)	No Data 0.17 - (RA)
SPONSORED CHEMICAL Hydrodesulfurized kerosene C9-C16 (64742-81-0)	No Data 0.11 (RA)	No Data 0.9 (RA)	No Data 0.4 >0.4 (RA)	No Data 0.17 - (RA)
SPONSORED CHEMICAL Distillates (petroleum), hydrotreated light C9-C16 (64742-47-8)	No Data 0.11 (RA)	No Data 0.9 (RA)	No Data 0.4 >0.4 (RA)	No Data 0.17 - (RA)
SPONSORED CHEMICAL Heavy aliphatic solvent naphtha C11-C16 (64742-96-7)	No Data 0.11 (RA)	No Data 0.9 (RA)	No Data 0.4 >0.4 (RA)	No Data 0.17 - (RA)
SUPPORTING CHEMICAL 1-Tetradecene, C14 (1120-36-1)	**NES**	**NES**	**NES NES**	**NES -**
SUPPORTING CHEMICAL 1-Hexadecene, C16 (629-73-2)	**NES**	**NES**	**NES NES**	- -

Bold = experimental data (i.e. derived from testing); data; RA = read across; − indicates that endpoint was not addressed for this chemical; ChV = chronic value; NES = No effects at saturation (the water solubility limit of the substance).

APPENDIX

While kerosenes are similar in composition, the precise composition of a specific kerosene-range refinery stream depends on the grade of crude oil from which the kerosene was derived and on the refinery processes used for its production. Because they are complex petroleum derived hydrocarbons, substances in this category are typically not defined by detailed compositional data but instead by process history, physical properties, and product-use specifications. Regardless of the crude oil source or processing history, the major components of all kerosenes are branched and straight chain paraffins and naphthenes (cycloparaffins), which normally account for at least 70% by volume. Aromatic hydrocarbons in this boiling range, such as alkylbenzenes (single ring) and alkylnaphthalenes (double ring) do not normally exceed 25% by volume of kerosene streams. Olefins are usually not present at more than 5% by volume.

- Tables 6-8 show limited compositional data available for certain jet fuels.
- Table 9 shows representative structures of the sponsored substances and supporting chemicals

Table 6. Compositional data for JP-4[1]		
Constituent	**Weight % (Shale-derived)**	**Weight % (Petroleum-derived)**
Heptane	4.73	15.75
Octane	7.48	6.60
Nonane	7.24	2.54
Decane	11.25	2.24
Indane	0.42	0.17
Undecane	16.62	4.17
Dodecane	11.49	5.25
Tridecane	6.07	4.71
Tetradecane	3.19	1.02
Pentadecane	0.96	1.35
3-Methylhexane	3.05	14.39
2-Methylheptane	3.08	6.14
3-Methylheptane	1.64	7.19
2,3-Diethylpentane	0.18	1.48
2,5-Dimethylpentane	0.63	2.52
2,4-Dimethylpentane	0.81	4.00
Cyclohexane	1.52	2.13
Methylcyclohexane	5.68	2.17
Ethylcyclohexane	–	–
Methylbenzene	3.77	3.41
m-Xylene	2.60	2.71
p-Xylene	1.70	1.63
o-Xylene	2.00	1.89
1,3,5-Trimethylbenzene	1.52	1.09
1,2,4-Trimethylbenzene	2.00	3.52
1,2,3-Trimethylbenzene	0.30	1.04

[1] Agency for Toxic Substances and Disease Registry. 2005. Toxicological Profile for Jet Fuels JP-4 and JP-7. Available online at http://www.atsdr.cdc.gov/ToxProfiles/tp.asp?id=768&tid=149 as of January 14, 2011.

Table 7. Compositional data for JP-8[1]	
Constituent	**Weight %**
Isooctane	3.66
Methylcyclohexane	3.51
m-Xylene	3.95
Cyclooctane	4.54
Decane	16.08
Butylbenzene	4.72
1,2,4,5-Tetramethylbenzene	4.28
Tetralin	4.14
Dodecane	22.54
1-Methylnaphthalene	3.49
Tetradecane	16.87
Hexadecane	12.22

[1] Agency for Toxic Substances and Disease Registry. 2005. Toxicological Profile for Jet Fuels JP-5 and JP-8. Available online at http://www.atsdr.cdc.gov/ToxProfiles/tp.asp?id=773&tid=150 as of January 14, 2011.

Table 8. Major hydrocarbon proportions for a batch of JP-8[1]	
Constituent	**Weight %**
Undecane	6.0
Dodecane	4.5
Decane	3.8
Tridecane	2.7
Tetradecane	1.8
Methyl naphthalenes	1.2
Nonane	1.1
Trimethylbenzene	1.0
Pentadecane	1.0
Dimethylnaphthalenes	0.78
Xylenes	0.58
Naphthalene	0.26
Ethylbenzene	0.15
Diethylene glycolmonomethyl ether	0.08
Toluene	0.06

[1] McDougal JN., Pollard DL., Weisman W., Garrett C., Miller TE. 2000. Assessment of skin absorption and penetration of JP-8 Jet Fuel and its components. Toxicol. Sci. 55: 247-255

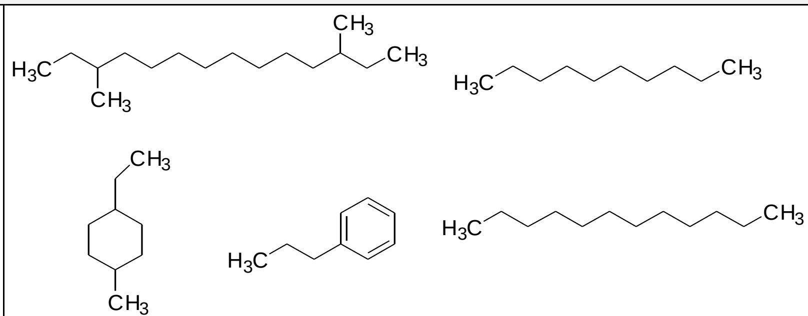
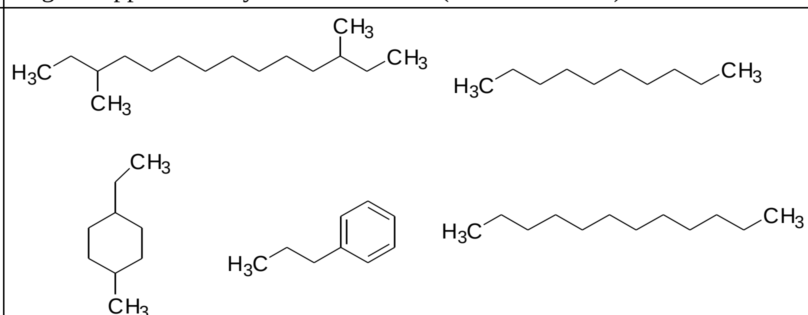
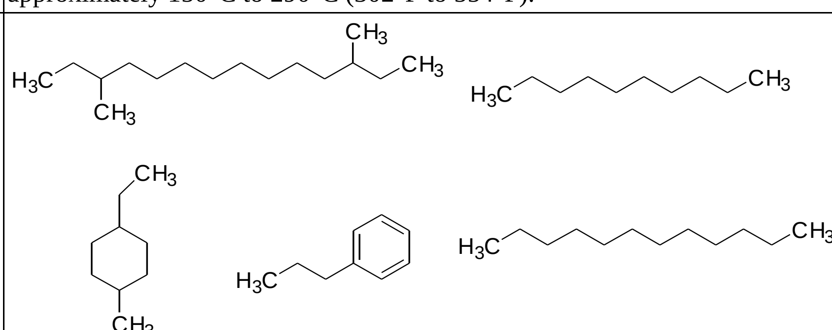
Table 9. Process Streams, CASRN, and Description of the Kerosene/Jet Fuels Category		
CA Index Name	**CASRN**	**TSCA Description**
		Sponsored Chemicals
Kerosene (petroleum)	8008-20-6	 Straight Run, Kerosene (petroleum). A complex combination of hydrocarbons produced by the distillation of crude oil. It consists of hydrocarbons having carbon numbers predominantly in the range of C9 through C16 and boiling in the range of approximately 180°C to 300°C (356°F to 572°F).
Distillates (petroleum), acid-treated light	64742-14-9	 A complex combination of hydrocarbons obtained as a raffinate from a sulfuric acid treating process. It consists of hydrocarbons having carbon numbers predominantly in the range of C9 through C16 and boiling in the range of approximately 150°C to 290°C (302°F to 554°F).
Distillates (petroleum), chemically neutralized light	64742-31-0	 A complex combination of hydrocarbons produced by a treating process to remove acidic materials. It consists of hydrocarbons having carbon numbers predominantly in the range of C9 through C16 and boiling in the range of approximately 150°C to 290°C (302°F to 554°F).

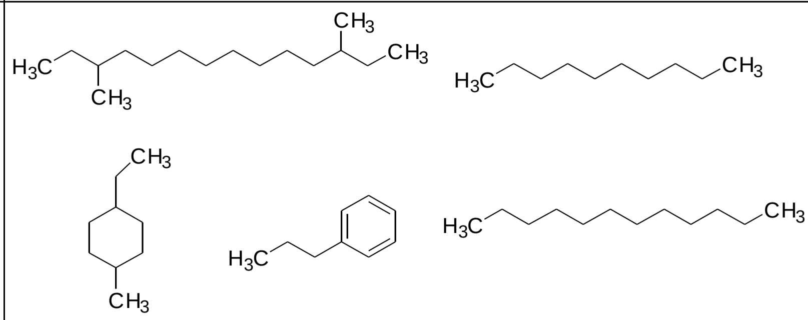
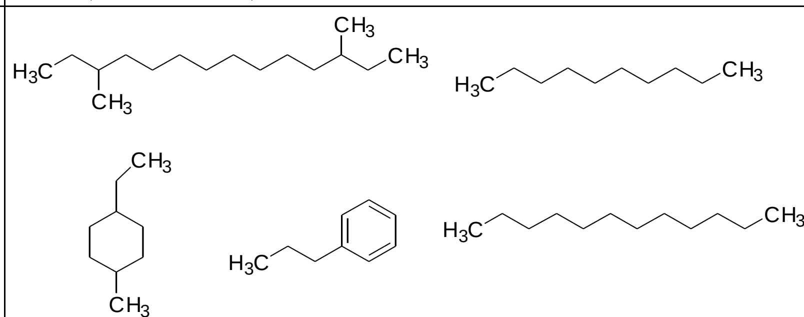
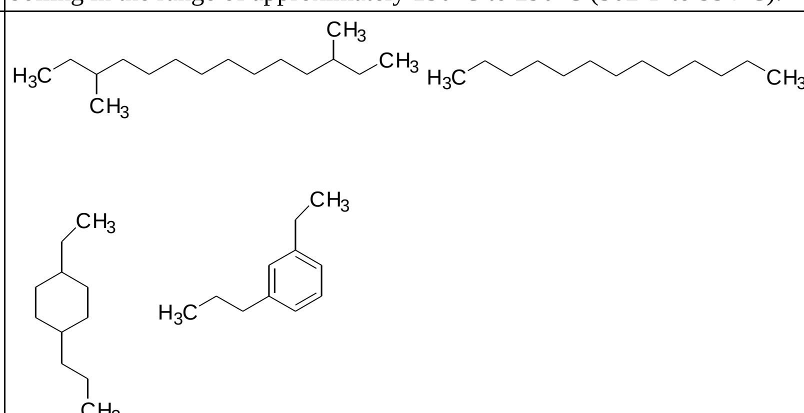
Table 9. Process Streams, CASRN, and Description of the Kerosene/Jet Fuels Category		
CA Index Name	**CASRN**	**TSCA Description**
Kerosene (petroleum), hydrodesulfurized	64742-81-0	 A complex combination of hydrocarbons obtained from a petroleum stock by treating with hydrogen to convert organic sulfur to hydrogen sulfide which is removed. It consists of hydrocarbons having carbon numbers predominantly in the range of C9 through C16 and boiling in the range of approximately 150°C to 290°C (302°Fto 554°F).
Distillates (petroleum), hydrotreated light	64742-47-8	 A complex combination of hydrocarbons obtained by treating a petroleum fraction with hydrogen in the presence of a catalyst. It consists of hydrocarbons having carbon numbers predominantly in the range of C9 through C16 and boiling in the range of approximately 150°C to 290°C (302°F to 554°C).
Solvent naphtha (petroleum), heavy aliph.	64742-96-7	 A complex combination of hydrocarbons obtained from the distillation of crude oil or natural gasoline. It consists predominantly of saturated hydrocarbons having carbon numbers predominantly in the range of C11 through C16 and boiling in the range of approximately 190°C to 290°C (374°F to 554°F).

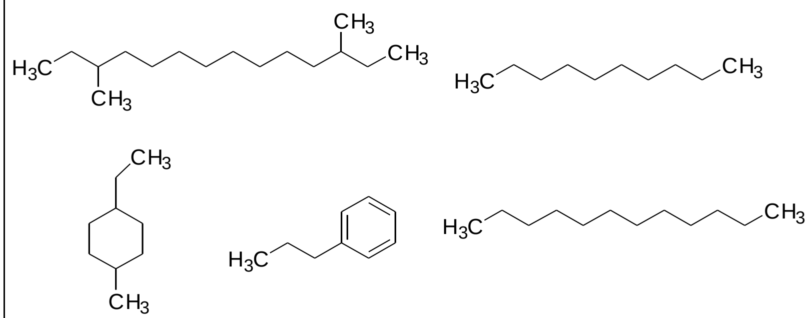
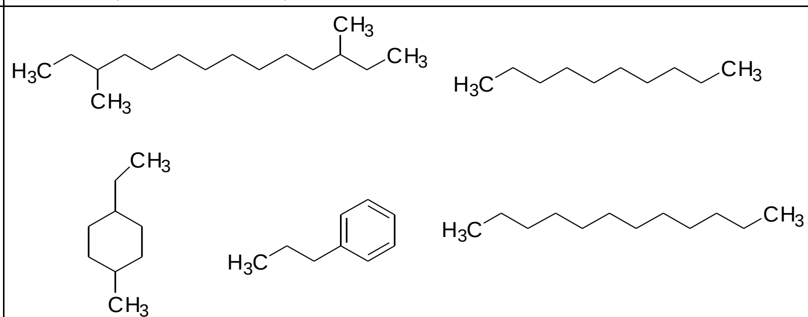
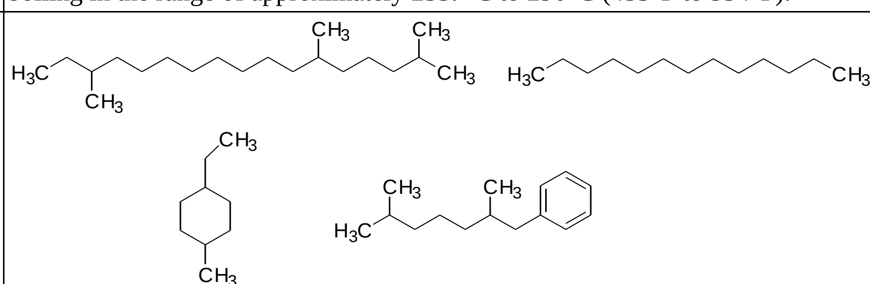
Table 9. Process Streams, CASRN, and Description of the Kerosene/Jet Fuels Category		
CA Index Name	**CASRN**	**TSCA Description**
	Supporting Chemicals	
Kerosene (petroleum), sweetened	91770-15-9	 A complex combination of hydrocarbons obtained by subjecting a petroleum distillate to a sweetening process to convert mercaptans or to remove acidic impurities. It consists predominantly of hydrocarbons having carbon numbers predominantly in the range of C9 through C16 and boiling in the range of 130°C to 290°C (266°F to 544°F).
Solvent naphtha (petroleum), hydrocracked heavy arom.	101316-80-7	 A complex combination of hydrocarbons obtained by the distillation of hydrocracked petroleum distillate. It consists predominantly of hydrocarbons having carbon numbers predominantly in the range of C9 through C16 and boiling in the range of approximately 235. °C to 290°C (455°F to 554°F).
Fuels, diesel	68334-30-5	 A complex combination of hydrocarbons produced by the distillation of crude oil. It consists of hydrocarbons having carbon numbers predominantly in the range of C9 through C20 and boiling in the range of approximately 163°C to 357°C (325°F to 675°F).

Table 9. Process Streams, CASRN, and Description of the Kerosene/Jet Fuels Category

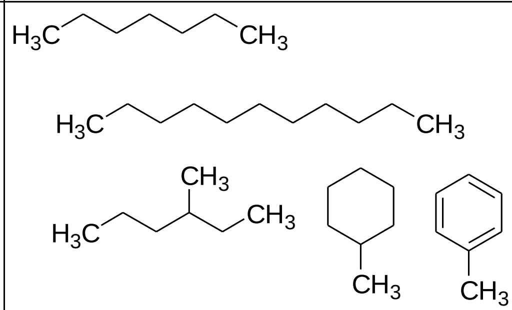
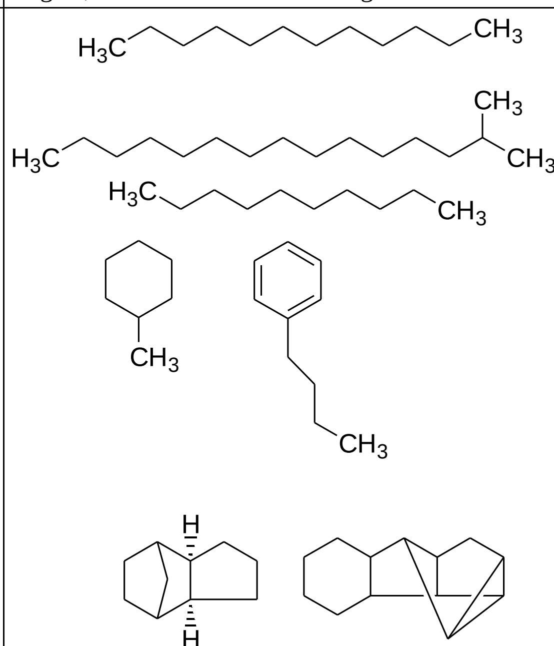
CA Index Name	CASRN	TSCA Description
Jet Propellant 4 (JP-4)	50815-00-4	 Structures drawn for representative paraffins, napthenes, and aromatics from compositional data as reported in table A-1. The composition of JP-4 is approximately 13% (v/v) aromatic hydrocarbons, 1.0% olefin hydrocarbons, and 86% saturated hydrocarbons. JP-4 is a wide-cut fuel because it is produced from a broad distillation temperature range and contains a wide array of carbon chain-lengths, from 4 to 16 carbons long. [1]
4,7-Methano-2,3,8-methenocyclopent[a]indene, dodecahydro-, stereoisomer, mixt. with methylcyclohexane and rel-(3aR,4S,7R,7aS)-octahydro-4,7-methano-1H-indene (JP-8)	82863-50-1	 Structures drawn for representative paraffins, napthenes, and aromatics from compositional data as reported in table A-2 and the CAS name associated with 82863-50-1.[2]

Table 9. Process Streams, CASRN, and Description of the Kerosene/Jet Fuels Category

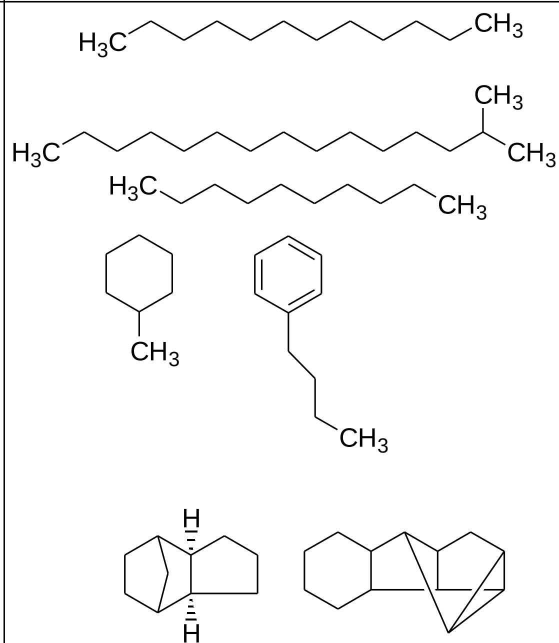
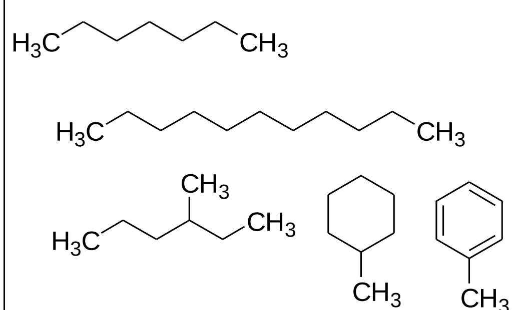
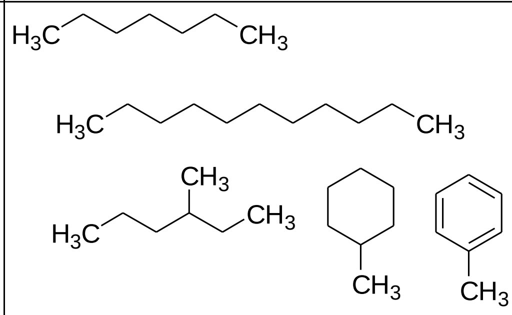
CA Index Name	CASRN	TSCA Description
Jet Propellant 5 (JP-5)	No CASRN	 No compositional data are available regarding JP-5 however both JP-5 and JP-8 are distillate fuels consisting of distilled process streams refined from crude petroleum and the characteristics of JP-8 fuel (such as density and distillation temperatures) are very similar to those of JP-5[3]
Jet Fuel B	No CASRN	 Jet B is a distillate covering the naphtha and kerosene fractions. It can be used as an alternative to Jet A-1 but because it is more difficult to handle (higher flammability), there is only significant demand in very cold climates where its better cold weather performance is important. In Canada it is supplied against the Canadian Specification CAN/CGSB 3.23. (http://www.csgnetwork.com/jetfuel.html)

Table 9. Process Streams, CASRN, and Description of the Kerosene/Jet Fuels Category

CA Index Name	CASRN	TSCA Description
Jet Fuel A/A-1 (aviation turbine fuel, kerosene type)	No CASRN	 Jet A-1 is a kerosene grade of fuel suitable for most turbine engined aircraft. It is produced to a stringent internationally agreed standard, has a flash point above 38°C (100°F) and a freeze point maximum of -47°C. It is widely available outside the U.S. Jet A-1 meets the requirements of British specification DEF STAN 91-91 (Jet A-1), (formerly DERD 2494 [AVTUR]), ASTM specification D1655 (Jet A-1) and IATA Guidance Material (Kerosine Type), NATO Code F-35. Jet A is nearly identical to Jet A-1, except that it has a different combination of additives and a freezing point of -40°C. (http://www.csgnetwork.com/jetfuel.html)
JP-8 Jet Fuel	No CASRN	JP-8 is the military equivalent of Jet A-1 with the addition of corrosion inhibitor and anti-icing additives; it meets the requirements of the U.S. Military Specification MIL-DTL-83133E. JP-8 also meets the requirements of the British Specification DEF STAN 91-87 AVTUR/FSII (formerly DERD 2453). NATO Code F-34. (http://www.csgnetwork.com/jetfuel.html)
Naphtha (petroleum), hydrotreated heavy	64742-48-9	From the C7-C9 Aliphatic Hydrocarbon Solvents Category SIAP (http://webnet.oecd.org/hpv/UI/SIDS_Details.aspx?Key=d3906311-a0e0-4fe8-a66b-7159b864a557&idx=0): UVCB substances containing aliphatic (linear, branched, and cyclic paraffins) molecules of carbon and hydrogen, predominantly in the C7 to C9 range. The category only includes substances that have boiling ranges falling within approximately 90 to 151 degrees Celsius.
Naphtha (petroleum), hydrotreated light	64742-49-0	
Alkanes, C_{7-10}, iso-	90622-56-3	From the C7-C9 Aliphatic Hydrocarbon Solvents Category SIAP (http://webnet.oecd.org/hpv/UI/SIDS_Details.aspx?Key=d3906311-a0e0-4fe8-a66b-7159b864a557&idx=0): A multi-constituent substance that can be composed predominantly of branched C7, C8, and/or C9 isoparaffin isomers, which can include methyl-hexanes, heptanes, and/or octanes; dimethyl- pentanes, hexanes, and/or heptanes; and trimethylpentanes and/or –hexanes.
1-Tetradecene	1120-36-1	See http://www.chem.unep.ch/irptc/sids/OECDSIDS/AOalfaolefins.pdf.
1-Hexadecene	629-73-2	See http://www.chem.unep.ch/irptc/sids/OECDSIDS/HigherOlefins.pdf

[1] Agency for Toxic Substances and Disease Registry. 2005. Toxicological Profile for Jet Fuels JP-4 and JP-7. Available online at http://www.atsdr.cdc.gov/ToxProfiles/tp.asp?id=768&tid=149 as of January 14, 2011.
[2] The CAS entry in STN showing the synonym for this mixture was JP 9, but that the sponsor designates this substance as JP 8. The CAS name only designates three compounds in the mixture, but it is clear that this jet fuel would contain many different hydrocarbons.
[3] Agency for Toxic Substances and Disease Registry. 2005. Toxicological Profile for Jet Fuels JP-5 and JP-8. Available online at http://www.atsdr.cdc.gov/ToxProfiles/tp.asp?id=773&tid=150 as of January 14, 2011.